सत्यमेव जयते

# Report of the Comptroller and Auditor General of India

## for the year ended 31 March 2020

भारतीय लेखापरीक्षा और लेखा विभाग ✦ INDIAN AUDIT AND ACCOUNTS DEPARTMENT

लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest

## Compliance Audit of Activities of Rashtriya Ispat Nigam Limited Union Government (Commercial) No. 7 of 2022

# Report of the
# Comptroller and Auditor General of India

## for the year ended March 2020

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## Rashtriya Ispat Nigam Limited
## Union Government (Commercial)
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# PREFACE

1. This Report of the Comptroller and Auditor General of India has been prepared for submission to the Government under the provisions of Section 19-A of the Comptroller and Auditor General's (Duties, Powers and Conditions of Service) Act, 1971, as amended in 1984.

2. This Report contains the results of reviews on 02 selected areas of operation of Rashtriya Ispat Nigam Limited under the administrative control of Ministry of Steel, Government of India as detailed below:

a. Category-I Capital Repairs of Blast Furnaces No.1 and 2
b. Assessment of Environmental Issues

3. The Audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

# EXECUTIVE SUMMARY

## I Introduction

This Audit Report contains reviews on 02 selected areas of operation of Rashtriya Ispat Nigam Limited (RINL) under the administrative control of Ministry of Steel, Government of India. These areas were selected in Audit for review on the basis of their relative importance in the functioning of the concerned organisation. This Audit Report includes the following reviews related to RINL:

1. Category-I Capital Repairs of Blast Furnaces No.1 and 2
2. Assessment of Environmental Issues

## II Highlights

**Highlights of significant observations on the selected areas included in the Report are given below:**

***Category-I Capital Repairs of Blast Furnaces No. 1 and 2***

Blast Furnaces No. 1 and 2 of Rashtriya Ispat Nigam Limited (RINL) were commissioned in March 1990 and March 1992 under the supervision of M/s Gipromez, Russia and certain norms were prescribed by them for the periodicity and type of capital repairs. Audit scope included review of overall process of Category-I capital repairs, which are major repairs of these furnaces, and performance of Blast Furnaces after Category-I capital repairs with reference to the performance parameters projected in the Feasibility Reports and Agreements concluded with the suppliers.

**(Para 1.1 & 1.2)**

As against the scheduled time of 14 to 16 years from commissioning, for carrying out Category-I capital repairs, the actual repairs were done after 23 years and 24 years of commissioning of Blast Furnace No. 1 and Blast Furnace No. 2 respectively. This resulted in deterioration of the hearth of furnaces. Due to this, furnaces were operated under restricted regime and there was loss of production of 1.78 million tonnes of hot metal from 2011-12 to 2015-16 with consequential loss of earnings of ₹1,396.64 crore. RINL could have produced additional 7.51 million tonnes of hot metal had it carried out Category-I repairs of Blast Furnaces No. 1 and 2 in the year 2010 itself as planned.

**(Para 1.6.1)**

There were delays in execution of Main Package as well as Auxiliary Packages of Category-I capital repairs of Blast Furnaces No. 1 and 2 despite the existence of a consultant to monitor the execution of the Project and follow-up by the higher management of RINL which suggests weaknesses in the monitoring mechanism. Subsequently, after the completion of Category-I capital repairs, there was loss of

production of 4.93 million tonnes of hot metal with consequential loss of earnings of ₹1,844.82 crore as the Blast Furnaces were not utilised to their rated capacities mainly due to non-synchronization of revamping of other upstream/downstream facilities. Also, there was loss of production of 2.36 million tonnes of hot metal with consequential loss of earnings of ₹810.38 crore because of forced shutdown of Blast Furnace No. 2 due to non-integration of Upstream and Downstream Plants. Thus, in total, there was loss of production of 7.29 million tonnes of hot metal after Category-I capital repairs with consequential loss of earnings of ₹2,655.20 crore.

**(Para 1.6.2, 1.6.5 & 1.6.7)**

There was delay in initiation of tenders/ award of contracts for Upstream and Downstream Plants resulting in mismatch between the production capacities of different units. Consequently, there was shortage of sinter and coke from Sinter Plants and Coke Oven Batteries respectively. This also resulted in additional cost towards coke procurement amounting to ₹788.60 crore.

**(Para 1.6.4)**

Fuel consumption was higher than the guaranteed norms resulting in additional cost towards increased consumption of coke amounting to ₹354.09 crore. Further, reduced infusion of Pulverised Coal resulted in additional cost of ₹1,279.69 crore.

**(Para 1.6.7)**

Thus, it can be seen that planning for capital repairs of Blast Furnaces No. 1 and 2 was not made holistically considering the increased requirement of raw material as well as downstream facilities to process enhanced production of hot metal from blast furnaces after Category-I capital repairs. Further, significant delays in carrying out these repairs coupled with non-synchronization of revamping of upstream and downstream facilities led to significant loss of production and earnings totalling ₹6,665.80 crore prior to as well as after conducting of these repairs. Delays in execution of main as well as all the auxiliary packages for capital repairs of both the furnaces clearly indicate the deficiencies of monitoring mechanism of RINL.

**(Para 1.6.8)**

**With regard to Chapter on Category-I Capital Repairs of Blast Furnaces No. 1 and 2, Audit recommends that:**

- ***Timely repairs of major Plants/ equipment may be ensured to maintain the efficiency of the Plant as well as attain optimum production levels.***
- ***Necessary steps may be taken for timely arrangement of logistics, regular follow-up with contractors/ suppliers and co-ordination amongst various***

***departments of RINL to ensure execution of all the Projects within stipulated and committed timeframes to achieve anticipated benefits.***

- ***Proper mechanism may be instituted to carry out delay analysis to clearly establish the role of Company Officials as well as role of Contractors in the delays. Progress of all the major works needs to be reported to the Ministry and Board for regular periodical reviews.***
- ***Responsibility needs to be fixed for various delays, such as delayed blow-in of Blast Furnace No. 2 due to non-revamping of upstream and downstream plants in time, non-arrangement of logistics for delivery of material etc.***
- ***Holistic Planning needs to be done to ensure revamping of all the upstream/ downstream facilities in synchronization with upgradation of main plants/ blast furnaces. Special efforts are required to be made to reduce delays in finalization of terms of tenders, resolving techno-commercial issues, tender evaluation and resultant delays in placement of orders to ensure timely execution of planned activities. Responsibility also needs to be fixed in all the areas of inordinate delays in execution.***
- ***Necessary steps may be taken to make available the required input raw material to operate the furnaces at their rated capacities and also ensure consumption of pulverised coal at the desired level of 150 kilograms per tonne of hot metal to achieve optimum production level. A periodic compliance report in this regard may be sent by the Company to the Board and the Ministry.***
- ***Project monitoring mechanism at Board level needs to be strengthened in all the areas right from conceptualization of the project, placement of orders till execution of the Project to ensure timely completion of all the envisaged Projects. For this purpose, submission of reports to the Board at least on quarterly basis on progress of all major projects may be ensured.***

***Assessment of Environmental Issues***

As Steel Plants are one of the highly polluting industries, compliance to various regulations made for protection of the environment is of utmost importance. Accordingly, audit was taken up to assess extent of compliance by RINL to Acts/Rules/Notifications framed by Government of India/ State Government. This audit covered period of three years from 2017-18 to 2019-20.

**(Para 2.1 & 2.3)**

Audit observed that RINL commenced operations under Capacity Expansion from 6.3 to 7.3 million tonnes per annum without obtaining Environmental Clearance from the Ministry of Environment, Forest and Climate Change as required vide Notification dated 14 September 2006 of the Ministry.

**(Para 2.5.1)**

Abatement of Air Pollution requires emission of certain gases/ substances to be kept within the prescribed norms. Audit noticed higher levels/ emissions of Carbon Monoxide (CO), Carbon Di Oxide ($CO_{2)}$, $PM_{10}$ when compared with Sustainability Plan targets and norms stipulated by regulatory bodies. There were excess fugitive and charging emissions from Coke Oven Batteries. RINL had not rebuilt its older Coke Oven Batteries as required under Charter on Corporate Responsibility for Environment Protection, 2003. Further, emissions data from Online Continuous Emission Monitoring Systems was not reliable due to non-upgradation of obsolete Online Continuous Emission Monitoring Systems.

**(Para 2.5.2)**

Specific energy consumption in the Plant and overall fuel consumption rate in Blast Furnaces were in excess of the targets stipulated in RINL's Sustainability Plan leading to release of excessive Green House Gases. On water pollution front also, effluents discharged by plants of RINL were in excess of the norms stipulated by the Ministry of Environment, Forest and Climate Change.

**(Para 2.5.4 & 2.5.7)**

Further, usage of high ash content boiler coal in Thermal Power Plant for power generation led to generation of higher quantities of fly ash. Non-utilisation of this fly ash in line with the Notifications issued by the Ministry of Environment, Forest and Climate Change led to water, air and land pollution. There has been accumulation of Blast Furnace/ Steel Melting Shop slags leading to air and land pollution.

**(Para 2.5.5)**

It was also noticed that Andhra Pradesh Pollution Control Board failed to arrest the continuous non-compliance by RINL to the norms stipulated by regulatory authorities with reference to emissions, flaring of gases, installation of equipment, generation of hazardous waste in excess of authorisation, etc. and take necessary action during various inspections of the Plant.

**(Para 2.6)**

Thus, RINL needs to improve its Environment Management System to overcome various deficiencies that have arisen due to non-compliance with emission norms, non-upgradation of pollution monitoring/ controlling equipment, non-revamping of old and pollution causing production machineries etc.

**(Para 2.8)**

**With regard to Chapter on Assessment of Environmental Issues, Audit recommends that:**

- ***Steps may be taken for regular monitoring of parameters like Percent Leaking Lids, Percent Leaking Doors and Percent Leaking Offtake etc., in Coke Oven Batteries to keep these under control and ensure compliance to the fugitive and charging emission norms as stipulated by Ministry of Environment, Forests and Climate Change. Necessary repairs/upgradation in technology required to be done in Coke Oven Batteries may also be carried out at the earliest.***
- ***RINL may put efforts to operate all facilities at their rated capacities to keep the $CO_2$ emissions within the Sustainability Plan Targets.***
- ***RINL may expedite the installation and functioning of Online Continuous Emission Monitoring Systems and carry out expert audit to check its proper functioning.***
- ***RINL may ensure the disposal of Halon Gas Cylinders at the earliest.***
- ***RINL may undertake rebuilding of the Coke Oven Batteries No. 1 to 3 in a phased manner to ensure that fugitive and charging emissions from them are controlled.***
- ***RINL may take steps to ensure effluents from Mechanical, Biological and Chemical Plant and Effluent Treatment Plant are within the norms as stipulated by Ministry of Environment, Forest and Climate Change. For ensuring this, periodical reports may be furnished to the Board/Ministry so that progress may be monitored regularly.***
- ***RINL may explore various possibilities of reducing ash content in the boiler coal and choose suitable methodology to ensure that ash content is within prescribed norms.***
- ***RINL may explore various alternatives for effective utilization of Blast Furnace/ Steel Melting Shop slag and fly ash.***
- ***RINL may strive to achieve its Sustainability Plan targets for reduction of specific energy consumption by optimum usage of coke, coal and power, etc. For ensuring this, periodical progress reports may be furnished to the Board/Ministry regularly for their monitoring.***

- ***Andhra Pradesh Pollution Control Board may consider reviewing the commitments given by RINL to keep the pollution levels within the norms and take appropriate timely action against RINL, as deemed fit.***

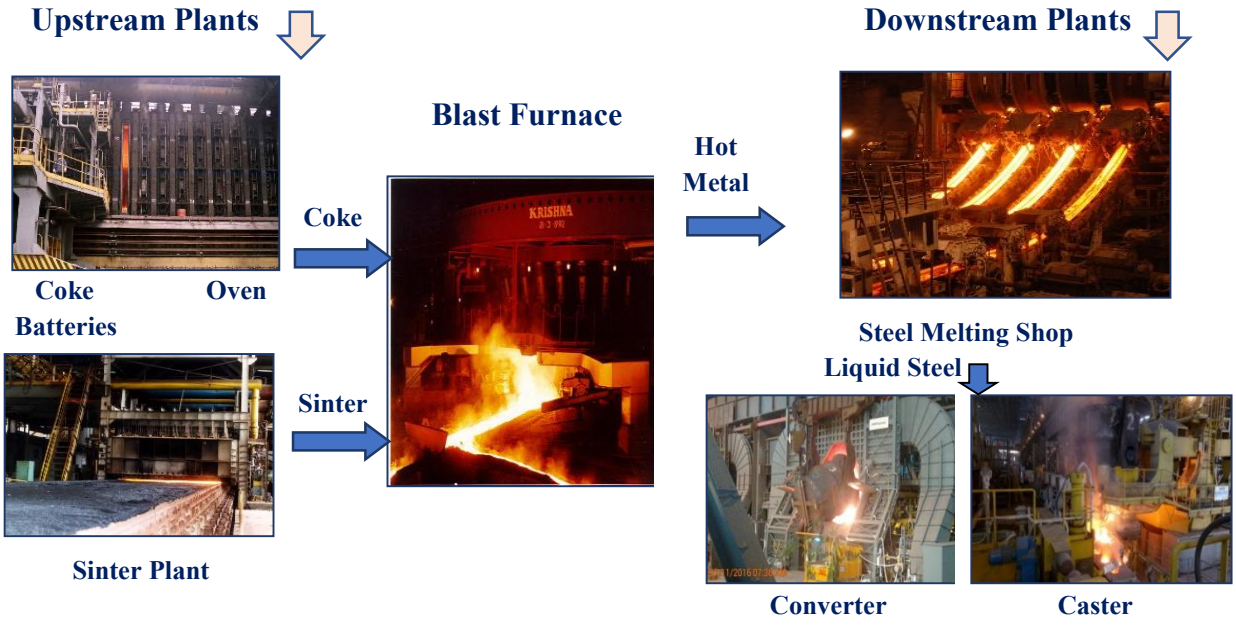
# CHAPTER I: Category-I capital repairs of Blast Furnaces No.1 and 2

## 1.1 Introduction

Rashtriya Ispat Nigam Limited (RINL/ Company), Visakhapatnam was incorporated (February 1982) under the administrative control of Ministry of Steel with an installed capacity of production of 3 million tonnes per annum of liquid steel[1] and commenced full-fledged operations from August 1992. RINL produces and sells iron and steel products in domestic and international markets. Capacity expansion to 6.3 million tonnes per annum of liquid steel corresponding to 6.5 million tonnes per annum of hot metal[2] and subsequently to 7.3 million tonnes per annum of liquid steel (hot metal 7.5 million tonnes) through upgradation/ modernisation was substantially[3] completed as of 31 March 2020.

The Major Plants in the process of steel making are indicated in the flow chart as follows:

**Chart 1.1: Flow chart indicating the major plants in steel making**




The initial two Blast Furnaces of RINL with design capacity of 1.7 million tonnes per annum of hot metal each were commissioned in March 1990 and March 1992 under the

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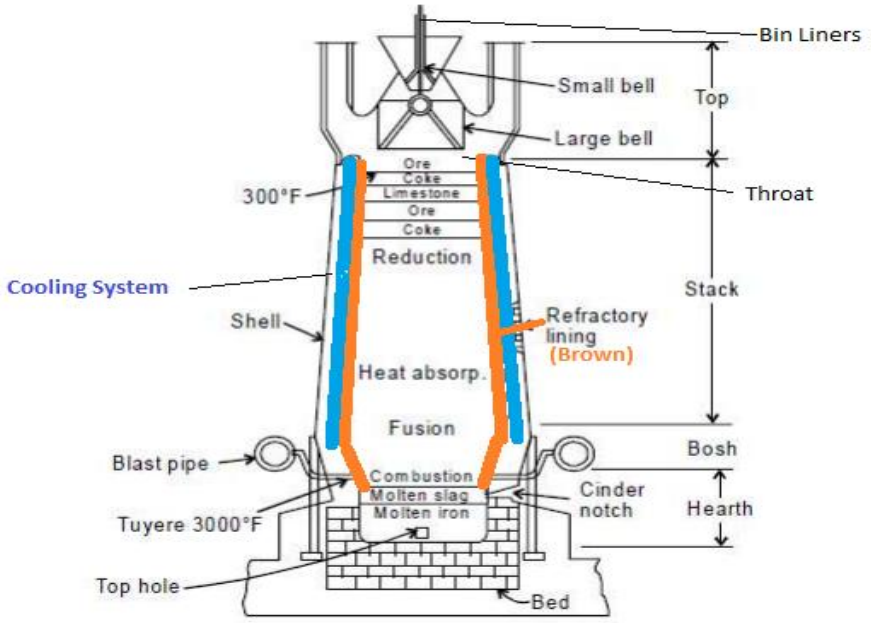
[1] *Corresponds to 3.40 million tonnes per annum of hot metal from Blast Furnace No. 1 and 2 with capacity of 1.70 million tonnes per annum each.*

[2] *Capacity of hot metal of 6.5 million tonnes per annum includes 2.50 million tonnes per annum through commissioning of Blast Furnace No. 3 in April 2012 and increase in capacity of Blast Furnaces No. 1 and 2 to 2 million tonnes per annum each subsequent to Category-II capital repairs.*

[3] *Except revamping of Sinter Machine No. 2 which is expected to be completed during 2021-22.*

supervision of M/s Gipromez, Russia. As per the norms stipulated by Gipromez, Russia, the periodicity and type of capital repairs depends on the design capacity and running time of the Blast Furnace.

**Figure 1.1: Parts of a Blast Furnace**




Capital repairs are of three categories:

- Category-III capital repairs include regular maintenance repairs like Throat brick lining, Bin liners changing, erection of fallen Dome lining plates, etc.

- Category-II capital repairs include Cooling System pipe changing, Tuyere stock changing, Throat segments changing, Partial Refractory changing in Hearth, etc.

- Category-I Capital Repairs planned by RINL include complete Furnace Capacity as well as technology upgradation works like (i) Replacing cast iron cooling plates with copper/ iron staves; (ii) Changing the refractories with better design and properties to increase volume of furnace, thereby enhancing production; (iii) Installation of energy efficient Heat Recovery Unit; (iv) Partial change in Blast Furnace top equipment; (v) Partial replacement of furnace shell; (vi) Level 2 automation (this system allows to stabilize the production process wherein the operator is guided through the different steps of production to ensure consistent and reproducible production); and (viii) New Gas Cleaning Plant, etc.

## 1.2 Scope of Audit

Audit scope included review of overall process of Category-I capital repairs and performance of Blast Furnaces after Category-I capital repairs with reference to the

performance parameters projected in the Feasibility Reports and Agreements concluded with the suppliers.

## 1.3 Audit objectives

Audit was conducted with the objectives to assess:

(i) Whether the Company planned the Category-I capital repairs of Blast Furnaces No. 1 and 2 comprehensively after considering the need for repairs, availability of raw materials required for additional production of hot metal and capacity to be augmented in the Upstream/ Downstream plants to effectively utilize the additional hot metal produced after such repairs;

(ii) Whether the Company implemented the Category-I capital repairs within the planned milestones, timeframes and approved project cost;

(iii) Whether Blast Furnaces No. 1 and 2 achieved the guaranteed production performance envisaged in the contracts after Category-I capital repairs; and

(iv) Whether an adequate and effective monitoring mechanism was in place to review the progress of project implementation and suggest remedial action, wherever required, to cover up the delays and avoid further delays.

## 1.4 Audit criteria

Audit criteria were derived from Detailed Project Reports for capacity expansion to 6.3 million tonnes per annum of liquid steel, Feasibility Reports for conducting Category-I Capital Repairs for Blast Furnaces No. 1 and 2 prepared by the Consultant (M/s M N Dastur and Co.), Agreements concluded with contractors, General Conditions of Contracts, Minutes of the Meetings of Board of Directors of RINL, Project Appraisal Mechanism, Minutes of Review Meetings by High Power Steering Committee and Plan of RINL for the revamping/ upgradation of Upstream and Downstream Plants required to effectively utilize the additional production from the Blast Furnaces after Category-I capital repairs.

## 1.5 Audit methodology

Virtual Entry Conference was held with RINL Management on 3 September 2020. Audit methodology included review of records, interaction and discussion with the Management, issue of Audit requisitions, soliciting records/ data/ information and issue of Audit observations and finalisation of draft Audit Report. The Audit findings observed during Audit were discussed in Exit Conference held on 22 February 2021.

## 1.6 Audit findings

The observations noticed in planning for Category-I capital repairs, award and execution of contracts and performance of Blast Furnaces No. 1 and 2 after Category-I capital repairs are discussed in the succeeding paragraphs.

### 1.6.1 Planning for Category-I capital repairs

The issues noticed in the Planning stage are mentioned below:

#### 1.6.1.1 Splitting up of works of Category-I capital repairs of Blast Furnace No. 1

The Feasibility Report for Category-I capital repairs of Blast Furnace No. 1 was prepared by M/s M N Dastur and Co. in July 2007. Cost of capital repairs was estimated in this feasibility report at ₹932 crore. As per Department of Public Enterprises guidelines, RINL, being Miniratna Company (Category-I) from May 2006, was empowered to incur capital expenditure up to ₹500 crore towards new projects, modernisation, purchase of equipment, etc., without the approval of Government of India.

RINL estimated cost of capital repairs at ₹792.15 crore and for taking approval from the Board of Directors, this cost was split into (i) Capital Repairs and (ii) Special Addition, Modification and Replacement works. Separate proposals were submitted to the Board of Directors for carrying out capital repairs at ₹472 crore in January 2008 and for Addition, Modification and Replacement works at ₹320.15 crore in May 2008. Thus, by splitting up the works of same project into two separate packages, RINL avoided seeking the approval of the Ministry of Steel.

The Ministry (June 2021) and the Management (March 2021) stated that the Feasibility Report was a preliminary study report intended to indicate the works to be performed under Category-I capital repairs of Blast Furnace No. 1 and also other auxiliary works to be taken up utilizing the opportunity of the shutdown period with an estimated cost of ₹932 crore. Based on the priority and nature of works, as well as the packaging structure and specifications, approval from the Board of Directors was obtained in January 2008 for the Main Package of Category-I capital repairs of Blast Furnace No. 1 for an estimated cost of ₹472 crore, which related to the activities basically necessary to be taken up immediately during the shutdown period to take care of the operating conditions of Blast Furnace No. 1 along with improvement in the productivity. Approval of Board of Directors was obtained in May 2008 for all other Packages under Special Addition, Modification and Replacement works for an estimated cost of ₹360.75 crore[4], which pertained to those activities which were independent and related to replacement of some of the old facilities which would contribute to better operating practices and also to meet statutory environmental pollution norms.

The reply is not acceptable as the works grouped under Addition, Modification and Replacement works were related to the same project of Category-I capital repairs of Blast Furnace No. 1 and were part and parcel of the Feasibility Report submitted by M/s M N Dastur and Co. These works related to capacity as well as technology upgradation and not routine Addition, Modification and Replacement works as contended by the Ministry/ Management. For instance, the works relating to Mud Gun and Drilling Machine,

[4] ***Includes ₹320.15 crore towards works relating to Blast Furnace No. 1 and ₹40.60 crore pertaining to other works.***

Augmentation of Water Systems, etc., which were awarded as Auxiliary Packages in case of Blast Furnace No. 1 were part and parcel of Main Package of Blast Furnace No. 2 and very much constituted as part of Category-I capital repairs of Blast Furnace No. 1. Therefore, based on the estimated cost and status of RINL being Miniratna Company, approval should have been obtained from Ministry of Steel as per the then extant delegation of powers. However, by splitting the works into two packages of less than ₹500 crore each, RINL obtained the approval of Board of Directors only and avoided seeking approval of the Ministry of Steel, which was required to be obtained for works above ₹500 crore.

In case of Blast Furnace No. 2, as RINL was conferred Navratna Status in November 2010 hence, Board of Directors of RINL was competent to approve the proposals up to ₹1,000 crore. Accordingly, the proposal for carrying out Category-I capital repairs of Blast Furnace No. 2 at an estimated cost of ₹877.73 crore was approved by the Board of Directors in July 2011 in one go.

### 1.6.1.2 Delay in taking up Category-I capital repairs

The periodicity of repairs stipulated by Gipromez Russia and compliance by RINL was as follows:

**Table 1.1: Prescribed Periodicity of Capital Repairs**

| Type of Capital Repairs | Periodicity from commissioning | Due | Compliance by RINL |
|---|---|---|---|
| Category-III | 1 - 2 years | Every alternate year | As per schedule |
| Category-II | 5 - 8 years | March 1995 to March 1998 (Blast Furnace No. 1) and March 1997 to March 2000 (Blast Furnace No. 2) | June 2000 (Blast Furnace No. 1) and May 2001 (Blast Furnace No. 2) |
| Category-I | 14 - 16 years | March 2004 to March 2006 (Blast Furnace No. 1) and March 2006 to March 2008 (Blast Furnace No. 2) | October 2013 to July 2014 (Blast Furnace No. 1) and May 2016 to October 2017 (Blast Furnace No. 2) |

Subsequent to Category-II capital repairs in June 2000 and May 2001, the production capacity of Blast Furnace No. 1 and Blast Furnace No. 2 increased from 1.7 to 2 million tonnes per annum of hot metal each. Subsequent to Category-I capital repairs in July 2014 and October 2017, the production capacity of Blast Furnace No. 1 and Blast Furnace No. 2 was proposed to increase further to 2.5 million tonnes per annum of hot metal each. However, the Blast Furnace No. 1 could reach only 2 million tonnes per annum in 2016-17 and Blast Furnace No. 2 could reach a maximum of 1.98 million tonnes per annum only in 2019-20 despite incurring huge expenditure as given below in Table 1.2. The reason for low performance of the Blast Furnaces was due to non-integration of Upstream and Downstream Plants which has been discussed subsequently at Para No. 1.6.4 *infra*.

**Table 1.2: Expenditure incurred on Category-I capital repairs**

**(₹ in crore)**

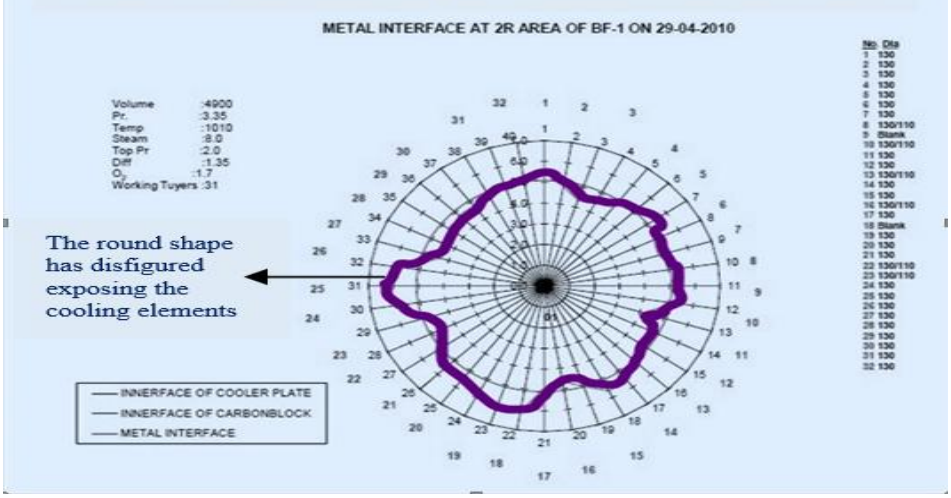
| Category-I capital repairs | Estimated expenditure | Cost of packages awarded | Expenditure as of 31.03.2020 |
|---|---|---|---|
| Blast Furnace No. 1 | 792.15 | 668.04 | 580.13 |
| Blast Furnace No. 2 | 877.73 | 872.73 | 745.61 |
| Total | **1669.88** | **1540.77** | **1325.74** |

Audit observed that though the proposal for carrying out Category-I capital repairs was initiated in May 2005, it took five years for placement of order for taking up of Category-I repairs of Blast Furnace No. 1 and eight years for Blast Furnace No. 2. The actual repairs of Blast Furnace No. 1 and Blast Furnace No. 2 were carried out during the periods October 2013 to July 2014 and during May 2016 to October 2017 respectively. The delay in taking up of Category-I capital repairs not only resulted in deterioration of condition of furnaces but also resulted in loss of production as discussed in the subsequent paragraphs.

### i) Deterioration of hearth[5] of Blast Furnaces

As against the scheduled time of 14 to 16 years from commissioning, for carrying out Category-I capital repairs, the actual repairs were done after 23 years and 24 years of commissioning of Blast Furnace No. 1 and Blast Furnace No. 2 respectively. RINL recorded (February/ May 2010) that condition of the furnaces particularly with respect to hearth condition was deteriorating and observed that 42 cooling elements[6] of Blast Furnaces No. 1 and 2 were burnt.

**Figure 1.2: Condition of Hearth of BF No. 1**




Residual thickness of refractory lining[7] in the areas of iron notches was 450 to 700 mm in Blast Furnace No. 1 and 540 to 750 mm in Blast Furnace No. 2 as against the original

[5] ***The bottom of furnace where hot metal and slag is collected and then tapped out is called hearth.***
[6] ***11 cooling elements in Blast Furnace No. 1 and 31 in Blast Furnace No. 2.***
[7] ***The lining for protecting the shell due to heat fluctuations is called Refractory Lining.***

thickness of 1,600 mm. RINL was procuring titanium ferro alloy to protect the hearth from further deterioration. Cooling plate temperatures were on the rise in the hearth (second row cooling plates) and, as a result, tuyeres blanking[8] was resorted to due to deterioration of hearth of furnaces, on a regular basis which was having a bearing on production. It was further recorded (May 2010) that the condition of the furnace already warranted running with a restricted/ throttled regime[9] and reduced production and it would not be possible to extend the campaign life[10] and as such the repairs were to be carried out at the earliest.

Thus, the above indicates that delay in carrying out the Category-I capital repairs had deteriorated the hearth of the furnaces and also resulted in operation of the plant in restricted regime with loss of production as discussed in subsequent paras.

Management stated (March 2021) that even after reaching the production of 25 million tonnes, conditions of the furnaces were not warranting a complete relining. Hence, operation was continued with an objective to maximise the throughput to the extent possible from the furnaces and ensure that there was no drastic fall in the production levels of the Company. It is a common practice to use hearth building techniques like addition of titanium ferro alloy towards the later part of a furnace campaign (life of furnace between capital repairs).

The Ministry, in its reply (June 2021), added that it was a prerequisite that Blast Furnace No. 3, coming up under 6.3 million tonnes expansion program, gets commissioned and stabilized before the oldest furnace i.e., Blast Furnace No. 1 could be given for shutdown for Capital Repairs. This was one of the prime reasons why Blast Furnace No. 1 could not be given for Capital Repairs before 2013, otherwise the Hot Metal production and in turn the Steel production would have reduced almost by 50 *per cent* thereby affecting the profitability of the Company significantly. Under these circumstances stretching the campaign life of Blast Furnaces No. 1 and 2 was the only option left which was executed with proper technological planning and expertise by way of going for hearth building techniques through addition of titanium ferro alloy.

The replies need to be viewed in light of the following facts:

- The approval of Board of Directors was obtained (January and May 2008) for conducting the Category-I capital repairs of Blast Furnaces No. 1 and 2 in the first and last quarter of 2010 respectively. It was further recorded (May 2010) that both Blast Furnaces No. 1 and 2 were long overdue for Category-I capital repairs as evident from the hearth diagnostics and that the condition of the furnaces already warranted running with restricted regime and reduced production. But, though RINL planned to conduct

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[8] ***Tuyere is a tube, nozzle or pipe through which hot air is blown into a Furnace or Hearth. These holes were blocked which is called blanking.***

[9] ***Operation of Plant with restricted production.***

[10] ***Campaign life of the Blast Furnace is the continuous running time of Blast Furnace from the time it is blown in (process of starting a Blast Furnace) for production of hot metal until it is put down for relining.***

Category-I Repairs in 2010, actual repairs were completed in 2014 and 2017. As a result, the condition of furnaces deteriorated further and RINL had to commence the Category-I capital repairs before obtaining the Environmental Clearance for which a show cause notice was issued to RINL by the Ministry of Environment and Forests. In response, RINL stated (March 2018) that had it not taken up these repairs urgently, it would have led to damage of equipment catastrophically at any time.

- A review of planning and implementation of commissioning of Blast Furnace No. 3 and conducting Category-I capital repairs of Blast Furnaces No. 1 and 2 reveals that there were delays in all the works. Scheduled commissioning of Blast Furnace No. 3 was in September 2008 and accordingly proposal to take up Capital Repairs to Blast Furnaces No. 1 and 2 during the year 2010, after commissioning of Blast Furnace No. 3, was submitted to the Board of Directors in January 2008 and May 2008. However, Blast Furnace No. 3 was commissioned in April 2012 and accordingly Category-I repairs to Blast Furnaces No. 1 and 2 also got delayed and health of these furnaces kept deteriorating.

- Further, the reply that if the Blast Furnace No. 1 was taken up for Category-I capital repairs before commissioning of Blast Furnace No. 3, there would have been loss of production of hot metal impacting the revenue of the Company needs to be viewed against the fact that had RINL implemented all the works timely[11] as planned, Category-I capital repairs of both Blast Furnaces No. 1 and 2 would have been completed in 2010 itself after commissioning of Blast Furnace No. 3. As a result, production capacity of Blast Furnaces No. 1 and 2 would have increased to 2.5 million tonnes per annum each and RINL would have been in a position to produce additional 75,14,267 tonnes[12] of hot metal during the years[13] 2011 to 2016.

Thus, RINL delayed the Category-I capital repairs despite the fact that the additional hot metal production would compensate the loss of production during the shutdown period of the Blast Furnaces No. 1 and 2. Operation of Blast Furnaces in throttled regime due to deteriorated hearth condition impacted the production of hot metal as discussed in the subsequent paragraph.

**(ii) Decrease in production**

RINL informed its Board of Directors (January and May 2008) that it intends to complete the Category-I capital repairs in 2010. However, the actual repairs of Blast Furnaces No. 1 and 2 were conducted during the period October 2013 to July 2014 and May 2016 to October 2017 respectively. The production of hot metal from Blast Furnaces No. 1 and 2

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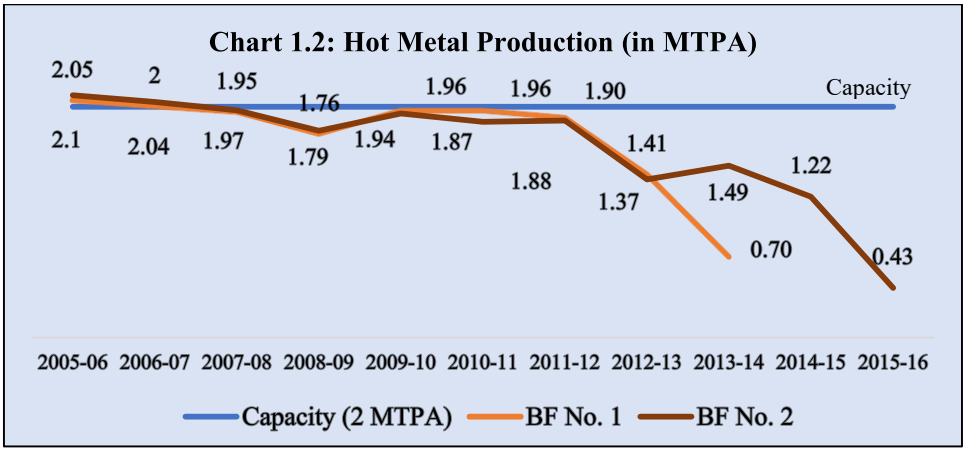
[11] ***Commissioning of Blast Furnace No. 3 in September 2008, conducting of Category-I Capital repairs of Blast Furnaces No. 1 and 2 in first and last quarter of 2010 respectively.***

[12] ***Blast Furnace No. 1 for April 2011 to October 2013 – 25,92,310 tonnes; Blast Furnace No. 2 for April 2011 to March 2016 – 49,21,957 tonnes.***

[13] ***Considering that Category-I Capital repairs of both furnaces was scheduled to be completed in the year 2010, loss of production has been worked out from April 2011 leaving a three months' period for stabilization, etc.***

was 2.05 and 2.10 million tonnes per annum respectively for the year 2005-06. The following chart gives the details of hot metal production from 2005-06 to 2015-16.




***Note: Blast Furnace No. 1 was operated until October 2013 and Blast Furnace No. 2 was operated until August 2015 before it was forced to shutdown.***

It is observed from the above Chart that the production of hot metal in Blast Furnaces No. 1 and 2 was in decreasing trend due to deterioration of the hearth of the furnace and from 2007-08 onwards, it was always less than the rated capacity of 2 million tonnes per annum of each Blast Furnace, as envisaged after completion of Category-II capital repairs of the Blast Furnaces.

As per the Cost Monitoring Group of RINL, one *per cent* increase in hot metal production would generate additional revenue between ₹406 lakh (2010-11) and ₹1,083 lakh (2015-16). As per the rated capacity of the Blast Furnaces at 4,860 tonnes[14] per day, operation of Blast Furnaces at lower capacities due to deterioration of hearth of furnaces resulted in loss of production of 17,81,224 tonnes of hot metal[15] from 2011-16. Considering the earnings anticipated by Cost Monitoring Group, the loss of additional revenue works out to ₹1,396.64 crore.

Further, had the repairs been completed as per the schedules stipulated by Gipromez Russia, the production of hot metal could have been enhanced to the rated capacity from 4,860 tonnes per day to 7,150 tonnes per day. Delay in completion of Category-I capital repairs of both the Blast Furnaces in the year 2010 as proposed to the Board of Directors in January/ May 2008 resulted in loss of production of 75,14,267 tonnes of hot metal from 2011-16 as mentioned in para 1.6.1.2 (i) *supra*. Considering the earnings anticipated by Cost Monitoring Group, the loss of additional revenue works out to ₹3,865.05 crore.

The Management stated (March 2021) that the production from Blast Furnaces No. 1 and 2 did not decrease due to hearth issues as observed in the Audit para, but because of operating the furnaces in throttled regime to match with the Downstream and Upstream

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[14] ***Taken from Feasibility Reports prepared by Consulting Engineer (M/s M N Dastur & Co.) on Category-I Capital Repairs of Blast Furnaces No. 1 and 2.***

[15] ***Blast Furnace No. 1 for April 2011 to October 2013 – 4,80,167 tonnes; Blast Furnace No. 2 for April 2011 to March 2016 – 13,01,057 tonnes.***

Plants during this transition phase of expansion and modernization. The Ministry endorsed (June 2021) the reply of Management.

The reply is not relevant in view of the fact that though the production facilities, both Upstream and Downstream, were adequate to handle the output of Blast Furnaces No. 1 and 2 before the commencement of capital repairs, the optimal production levels could not be achieved due to deterioration of the hearth of the furnaces with consequent operation of Blast Furnaces in restricted regime.

***Recommendation No. 1: Timely repairs of major Plants/ equipment may be ensured to maintain the efficiency of the Plant as well as attain optimum production levels.***

### 1.6.1.3 Non-revamping of Gas Expansion Turbine Stations No. 1 and 2 along with Category-I capital repairs of Blast Furnaces

RINL had installed (1993) two Gas Expansion Turbine Stations [16] No. 1 and 2 with a rated power generation capacity of 12 Mega Watt each to utilise waste pressure of Blast Furnace gas from Blast Furnaces No. 1 and 2 respectively. Gas Expansion Turbine Stations No. 1 and 2 have been put in operation for around 26 years from their commissioning in 1993 and maximum power generation achieved was around 8.5 Mega Watt each.

Though Blast Furnaces are equipped to work at top pressure of 2.5 kilograms/square centimetre, when these Blast Furnaces were working at reduced top pressure of 2 kilograms/ square centimetre, maximum power generation capacity of these Gas Expansion Turbine stations was 6 Mega Watt each. After revamping, even when Blast Furnace operates at reduced top pressure of 2 kilograms/ square centimetre, capacity of power generation of each Gas Expansion Turbine Station would have been 12 Mega Watt (with increase of 6 Mega Watt for each Gas Expansion Turbine Station). However, Gas Expansion Turbine Stations No. 1 and 2 were not revamped along with the Category-I capital repairs of Blast Furnaces No. 1 and 2 by October 2017. As a result, about 2,30,000 normal cubic meters per hour of Blast Furnace gas available after capital repairs was being bypassed through throttle assembly[17] and RINL was not able to convert the gases into energy.

Considering the estimated generation after revamp, i.e., increase of 6 Mega Watt each, the opportunity to generate energy was lost due to non-revamping of Gas Expansion Turbine Stations No. 1 and 2 which worked out to 321.44 million units during the period[18] July 2014 to March 2020. Loss of potential saving due to this works out to ₹107.60 crore with reference to variable cost of generation of power through Thermal Power Plant and it

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[16] ***The Blast Furnace gas that is generated during iron making in the Blast Furnace is passed through Gas Expansion Turbine Station to generate power.***

[17] ***Throttle Assembly is used for regulating top pressure of furnace.***

[18] ***Assuming completion of revamping of Gas Expansion Turbine Station 1 during the Category-I capital repairs of Blast Furnace No. 1 and that of Gas Expansion Turbine Station 2 with Category-I capital repairs of Blast Furnace No. 2.***

works out to ₹114.20 crore with reference to cost of purchasing power from Andhra Pradesh Eastern Power Distribution Company Limited.

Further, revamping of Gas Expansion Turbine Stations No. 1 and 2 requires shutdown of the units for around 18 months. During these 18 months, there would be no generation from Gas Expansion Turbine Stations No. 1 and 2 and the shortage would have to be met through Power Purchase Agreements. The additional cost for this was estimated by the Consultant (M/s M N Dastur and Co) at ₹54.95 crore[19]. Had RINL planned the revamping of Gas Expansion Turbine Stations No. 1 and 2 along with capital repairs of Blast Furnaces No. 1 and 2, the revamping could have been completed along with capital repairs and RINL could have avoided the estimated additional expenditure, due to further shutdown of Gas Expansion Turbine Stations No. 1 and 2, that it would have to incur, whenever this revamping work is taken up.

Ministry (June 2021) and the Management (March 2021) while confirming that revamping of Gas Expansion Turbine Stations No. 1 and 2 was not envisaged along with revamping of Blast Furnaces No. 1 and 2 stated that initially it was opined to defer revamping of Gas Expansion Turbine Stations No. 1 and 2 till the commissioning and stabilization of Top-Pressure Recovery Turbine[20] and completion of upgradation of Blast Furnaces No. 1 and 2. However, a Techno-Economic Feasibility Report was prepared in September 2020 and, in view of the high project cost[21], this renovation project of Gas Expansion Turbine Stations No. 1 and 2 was kept in abeyance. Regular efforts were made to utilize the additional quantity of Blast Furnace gas available after Category-I repairs.

The replies are not tenable as despite being aware of the additional Blast Furnace gas availability after Category-I capital repairs of Blast Furnaces No. 1 and 2, RINL did not initiate timely action for utilising the same. This has resulted in non-utilisation of additional gas available for generation of power at a cost much lesser than the cost of generation through Captive Power Plant or purchase from Andhra Pradesh Eastern Power Distribution Company Limited, resulting in additional expenditure.

Thus, failure to revamp Gas Expansion Turbine Stations No. 1 and 2 along with Category-I capital repairs of Blast Furnaces No. 1 and 2 has not only resulted in loss of savings of at least ₹107.60 crore due to loss of generation of 321.44 million units from Gas Expansion Turbine Stations No. 1 and 2 but might also result in estimated additional cost of ₹54.95 crore due to procurement of power through Power Purchase Agreements during the shutdown of Gas Expansion Turbine Stations No. 1 and 2 for their revamp, whenever taken up.

### 1.6.2 Award and execution of contracts

RINL awarded (August 2010) a contract to M/s M N Dastur and Co. for consultancy services for Category-I capital repairs of Blast Furnaces No. 1 and 2 for a period of 38

[19] ***Techno Economic Feasibility Report – September 2020.***
[20] ***Auxiliary Power Unit connected to Blast Furnace No. 3.***
[21] ***Estimated Project cost was ₹171.29 crore as per Techno Economic Feasibility Report 2020.***

months. RINL also entered into (February 2011 and August 2013) separate agreements with the Consortium of M/s Siemens VAI Metal Technologies Limited, United Kingdom(UK)[22] for Main Package of Category-I capital repairs of Blast Furnaces No. 1 and 2. Audit reviewed the consultancy contracts and Category-I capital repairs contracts and observed the following:

### 1.6.2.1 Unwarranted engagement of Consultant for Site supervision works for Category-I capital repairs

A proposal was initiated (11 February 2008) to engage a principal Consultant for the Category-I capital repairs of Blast Furnaces No. 1 and 2 including site supervision work as optional. The work of 'site supervision' was proposed to be excluded from the scope of work of Consultant due to formation of a separate group, viz., Modernization and Capital Repairs Department by RINL with its employees for conducting the capital repairs. The then Director (Finance) also proposed to keep the supervision of execution work with RINL. However, the Chairman and Managing Director overruled in favour of outsourcing and an order was accordingly placed (August 2010) on M/s M N Dastur and Co. for performing the consultancy services for the Category-I capital repairs of Blast Furnaces No. 1 and 2 including site supervision work (₹18.14 crore) at a cost of ₹51.12 crore.

Audit observed that RINL had created a dedicated Modernization and Capital Repairs Department as a nodal department to help plan, co-ordinate, and oversee execution of major modernization and capital repair works. Work of this department included *inter-alia* capital repairs of Category-I, II and III of blast furnaces. Further, agreements entered into with Siemens Consortium for conducting the capital repairs of Blast Furnaces No. 1 and 2 also stipulated for site supervision by the Consortium. Therefore, awarding of work of site supervision to M/s M N Dastur and Co. lacked justification and resulted in an additional expenditure of ₹18.14 crore.

Ministry (June 2021) and the Management (March 2021) stated that Modernization and Capital Repairs Department was formed (January 2008) as a nodal organization to help, plan, co-ordinate and oversee execution of major modernization and capital repair works. The manpower required for Category-I Capital repairs was expected to be more as the repair works were designed to upgrade and modernize by adopting state-of-the-art technologies, which warranted deployment of competent and experienced personnel for continuous effective site supervision. Many pre-shutdown activities were also envisaged and executed during the pre-shutdown period which warranted supervision during the pre-shutdown period also. It was also stated that though Modernization and Capital Repairs Department has been formed with an estimated manpower of around 45 executives, the actual manpower deployed never exceeded 25 executives and on an average of 15 executives. The Executives deployed for Category-I capital repairs of Blast Furnaces No. 1 and 2 never exceeded 10.

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[22] ***Name was changed to M/s Siemens Plc, United Kingdom in October 2012 and to M/s Primetals Technologies Limited in July 2015.***

The replies need to be seen in light of the fact that the role and responsibility of Modernization and Capital Repairs Department included Category-I, II and III repairs of blast furnaces. Further, while creating the Department, it was also recorded that at the time of execution of above works, increased requirement of supervision was to be supported from central maintenance groups and the concerned shops and other departments. Thus, the services of those personnel could have been utilised along with the executives of the Modernization and Capital Repairs Department. Further, creation of a dedicated Modernization and Capital Repairs Department without providing requisite manpower defeated the very objective of its creation.

Thus, unjustified award of a separate contract for site supervision works despite having a dedicated Modernization and Capital Repairs Department and experienced executives to oversee repair works resulted in additional expenditure of ₹18.14 crore.

### 1.6.2.2 Award and execution of contracts for Main as well as Auxiliary packages of Blast Furnaces No. 1 and 2

RINL divided the work of Category-I capital repairs into Main Package and Auxiliary Packages. It entered into agreements (February 2011) with the consortium[23] of M/s Siemens VAI Metal Technologies Limited, for the Main Package of Blast Furnace No. 1. The contract for Main Package of Blast Furnace No. 2 was entered into (August 2013) with the consortium[24] of M/s Siemens Plc, UK.

Audit reviewed these packages and found delays in all these works as explained below:

**i) Blast Furnace No. 1 Main Package**: This work was awarded to M/s Primetals (formerly known as Siemens VAI Metal Technologies Limited) at ₹317.73 crore with a completion schedule of 22 months from signing of the Agreement (9 February 2011). The scheduled time of completion was 9 December 2012. As against this, the actual date of completion was 30 July 2014.

The shutdown work commenced from 25 October 2013 instead of 10 August 2012 and was completed on 30 July 2014 instead of 9 December 2012. Contractual shutdown period was 120 days. Some additional works[25] were added in this and revised shutdown duration was worked out at 174.5 days against which the contractor took 277.50 days. Hence, net additional days taken by the contractor for shutdown were 103 days.

Delay Analysis Committee constituted (December 2017) for finalising the delay analysis stated (June 2018) that out of the overall delay of 103 days, 68 days of delay was attributable to Primetals Consortium. Accordingly, the expected contractual recoveries on account of milestone penalty and Liquidated Damages amounted to ₹79.60 crore *plus*

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[23] ***Comprising M/s Siemens VAI Metal Technologies Limited, UK, M/s Siemens VAI Metals Technologies Pvt. Limited India and M/s Gillanders Arbuthnot & Co. Limited, India.***

[24] ***Comprising M/s Siemens Plc, UK, M/s Siemens Limited, India, M/s Mukand Engineers Limited, India and M/s. Gillanders Arbuthnot & Co. Limited., India.***

[25] ***Shall Plugging (10 days), stave machining and damaged replacement (17.5 days) and tuyere piping modification (27 days).***

GBP 3.26 million. As against this, RINL withheld an amount of ₹28.33 crore *plus* GBP 0.80 million from the bills of the contractor.

M/s Primetals did not agree with the delay analysis and requested (July 2018/ February 2019) for shifting the milestone for shutdown activities as per Clause[26] 28.3 of the General Conditions of Contract to the actual date of completion, i.e., 30 July 2014 and to release the payments, failing which they would invoke arbitration. M/s M N Dastur and Co. stated (May 2019) that the delay analysis may be reviewed and finalised. RINL reconstituted (5 July 2019) the existing Delay Analysis Committee for considering the views of M/s. M N Dastur and Co. The reconstituted Delay Analysis Committee reviewed the delays and recommended (31 August 2019) for shifting of the milestone for shutdown activity date up to 30 July 2014 as per clause 28.3.

Meanwhile, M/s Primetals approached (6 August 2019) the International Court of Arbitration of the International Chamber of Commerce. During the negotiations, Primetals Consortium confirmed that the compensation and financial costs claimed by them in the arbitration would be withdrawn, subject to shifting of milestone for shutdown to 30 July 2014 and time of completion to 9 August 2014. RINL reached (August 2020) a settlement agreement with Primetals Consortium and as per the agreement, RINL shifted the shutdown milestone to 30 July 2014 and time of completion up to 9 August 2014 and agreed to pay ₹2.93 crore towards the extra works and ₹5.97 crore towards price variation amount.

The facts stated above were accepted by Ministry (June 2021) and the Management (March 2021) and it was added that the recommendation of Delay Analysis Committee was reviewed by third party, viz., M/s MECON who recommended (24 December 2019) that RINL may consider for amendment to the milestone for shutdown activity date to 30 July 2014 as per clause 28.3 as net delay was not attributable to M/s Primetals Consortium since Blast Furnace blow-in was delayed due to certain delays/ compulsions solely not attributable to Primetals Consortium.

The replies of the Ministry and the Management need to be seen in the light of the fact that the first Committee had attributed delay to M/s Primetals but the reconstituted committee reversed the report and recommended shifting of the activity milestones for shutdown due to which the company was not being able to levy any penalty on the contractor despite huge delays in the contract. This suggests that delays in completion were majorly on the part of RINL. So far as review by M/s MECON is concerned, a delay of 14 days was attributed to Primetals by M/s MECON which was also not considered by RINL and entire delay was accepted by RINL.

**ii) Blast Furnace No. 2 Main Package:** For this work, RINL signed (23 August 2013) an agreement with Consortium of M/s Siemens Plc, UK for undertaking the Category-I capital repairs of Blast Furnace No. 2 as Main Package at ₹507.33 crore with a

[26] ***Amendment to the milestone, due to any reasons attributable to the Employer (i.e., RINL).***

completion schedule of 23 months from signing of the agreement. The scheduled time of completion was 28 July 2015 against which the actual completion date was 17 November 2017 with a delay of 842 days.

Audit observed that as per delay analysis finalised by the Company, major delays in pre-shut down as well as shutdown activities were on the part of RINL like delay in procurement of Bell Less Top Charging[27] package (272 days), late opening of Letter of Credit by RINL (168 days) and delay in shutdown activities (354 days). Consequently, RINL incurred loss of production of hot metal for 733 days[28].

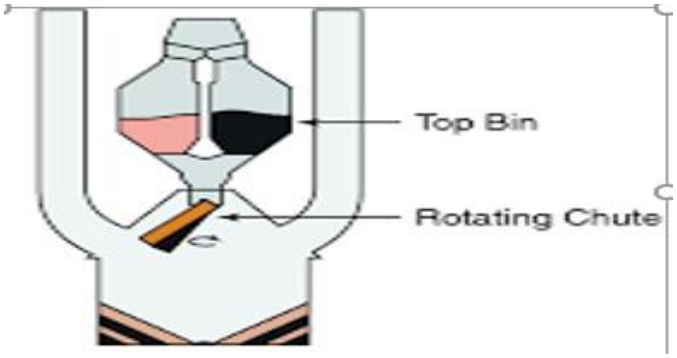


**Figure 1.3: Bell Less Top charging**

Ministry while accepting the delays on account of Letter of Credit opening and Bell Less Top Charging package supply stated (June 2021) that the above delays became insignificant since the overall delay in completion of Blast Furnace No. 2 Category-I capital repairs was attributable to the delays in the execution of Stock House Dust Extraction[29] No. 2 and Cast House Fume Exhaust System[30] No. 2 packages.

Ministry's reply that delays, which occurred in execution of Stock House Dust Extraction System and Cast House Fume Exhaust System delayed the overall execution of main package of Blast Furnace No. 2 is in contradiction of RINL's proposal (February 2017) for deferring the blow-in of Blast Furnace No. 2. Though this furnace was ready for blow-in in the second week of February 2017 after Category-I capital repairs, this note of February 2017 stated that blow-in was deferred due to non-availability of Upstream (viz.,

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[27] ***In blast furnaces with two bells charging system, two numbers of bells (small and big) are used to control the entry of charge materials in the blast furnace as well as to prevent escape of Blast Furnace gas in the environment. These bells are in conical shape. In case of Bell Less Top Charging Equipment, bells are replaced with a rotating chute for furnace charging.***

[28] ***Excluding 30 days on account of force majeure and 79 days towards additional jobs from total delay of 842 days.***

[29] ***Stock House is the place where furnace charging materials are stored, screened and weighed before sending to the furnace top for charging. During these processes, a lot of dust is generated. Dust Extraction System is installed to suck the air with fine dust. This air then passes through the Electro Static Precipitator where fine dust particles in the air are separated and the clean air is let into the atmosphere though chimney.***

[30] ***Cast House is the area around the blast furnace at the tap-hole level. It contains equipment for opening and closing of tap-hole and runners for flow of hot metal and liquid slag. Fumes are generated in the cast house at the time of tapping of hot metal and slag from blast furnace. Fume Exhaust System is installed to suck these fumes so that clean air is let into atmosphere.***

Sinter machine-1) and Downstream units (viz., Converter B of Steel Melting Shop-1 and fourth Caster in Steel Melting Shop-2). Further, revamping and upgradation of Cast House Fume Exhaust System was completed in November 2019 whereas Blast Furnace No. 2 was blown-in in October 2017.

Thus, failure of RINL to timely revamp upstream and downstream plants led to delayed blow-in of Blast Furnace No. 2 despite completion of Category-I repairs in February 2017.

**iii) Auxiliary Works:** RINL had also placed eight orders between November 2011 and November 2012 for carrying out the auxiliary works relating to Category-I capital repairs of Blast Furnace No. 1 and five orders between April 2014 and June 2015 for the auxiliary works relating to Blast Furnace No. 2.

Audit observed that none of these were completed within scheduled date of completion. Delays in some contracts are discussed in brief as under:

- **Blast Furnace No. 1**

Audit observed that none of the auxiliary works were completed within the scheduled date of completion as indicated in ***Annexure I***. Delays in completion ranged from 12 to 32 months.

Further, out of eight works mentioned in the above ***Annexure***, five works were completed after commencement of operations of Blast Furnace No. 1, post completion of its Category-I capital repairs in July 2014.

RINL recovered ₹16.48 crore from contractors in six contracts towards liquidated damages for the delay in execution of these contracts. Delay analysis in one more work viz., upgradation of Telecommunication System was yet to be finalised for levy of liquidated damages. It was also observed that though there was delay in completion of civil works by more than two years, no liquidated damages were recovered.

Management stated (March 2021) that due to inter-dependencies with other packages, the civil works could not be completed within the contractual schedule. Ministry added (June 2021) that Delay Analysis for Telecommunication system was finalised and communicated to the contractor. The contractor contested the Delay Analysis finalised by RINL and submitted relevant documents (April 2021) which were being scrutinized by the Consultant.

The reply needs to be seen in light of the fact that delayed completion of all the auxiliary works indicates inefficient coordination as well as ineffective monitoring and lack of follow up on the part of RINL.

- **Blast Furnace No. 2**

Audit observed that none of the auxiliary works relating to Blast Furnace No. 2 also were completed within the scheduled date of completion as indicated in ***Annexure I***. Delays ranged from 15 to 42 months.

Further, three out of five works were completed after commencement of operations of Blast Furnace No. 2 post completion of its Category-I capital repairs in October 2017.

RINL recovered ₹4.32 crore from the contractors towards liquidated damages for the delay in execution of three out of five auxiliary works. Though there was delay in supply of Bell Less Top Charging by more than one and half years, no liquidated damages were recovered from the contractor for the delay in supply. As against the scheduled date of completion of 2 December 2019 for upgradation of Telecommunication System, the same was completed on 31 March 2021. Delay Analysis was yet to be finalised for the levy of liquidated damages (June 2021).

With regard to delay in supply of Bell Less Top Charging (imported), Management stated (March 2021) that though the contractor was ready to deliver the material, there was delay on the part of RINL in arranging of containers and chartering. Ministry added (June 2021) that though the delivery schedule of the material was known in advance, sizing of containers and arrangement of containers and vessel was possible only after the material was ready for shipping. Replies were silent on other delays.

The reply indicates lack of proper planning by RINL. Despite being aware of the delivery schedule at the time of entering into the contract itself, RINL failed to make suitable arrangements for the logistics.

***Recommendation No. 2: Necessary steps may be taken for timely arrangement of logistics, regular follow-up with contractors/ suppliers and co-ordination amongst various departments of RINL to ensure execution of all the Projects within stipulated and committed timeframes to achieve anticipated benefits.***

***Recommendation No. 3: Proper mechanism may be instituted to carry out delay analysis to clearly establish the role of Company Officials as well as role of Contractors in the delays. Progress of all the major works needs to be reported to the Ministry and Board for regular periodical reviews.***

***Recommendation No. 4: Responsibility needs to be fixed for various delays, such as delayed blow-in of Blast Furnace No. 2 due to non-revamping of upstream and downstream plants in time, non-arrangement of logistics for delivery of material etc.***

### 1.6.3 Delay in award of contract for revamping of stoves

There are four hot blast stoves for each furnace, Stoves No. 1, 2, 3 and 4 for Blast Furnace No. 1 and Stoves No. 5, 6, 7 and 8 for Blast Furnace No. 2, with a total heating surface of 2,24,000 sq. m. The stoves are capable of giving a blast temperature up to 1,300$^0$C. Stoves are heated by a mixture of blast furnace gas and coke oven gas. Out of the four stoves available, blast furnaces require minimum three stoves each for operation and one stove as standby.

Board of Directors approved (July 2011) the proposal of RINL to upgrade five[31] stoves out of eight, viz., two stoves of Blast Furnace No. 1 and three stoves of Blast Furnace No. 2 along with Category-I capital repairs of Blast Furnace No. 2. RINL placed (23 August 2013) an order on M/s Siemens Consortium (presently M/s Primetals) for upgradation of five stoves at ₹140.72 crore with a completion schedule of 30 months from the date of placement of order, i.e., by 28 February 2016. M/s Primetals commissioned four[32] stoves (1 stove in Blast Furnace No. 1 and 3 stoves in Blast Furnace No. 2) while work in respect of balance one stove (Stove No. 2 of Blast Furnace No. 1) was still under progress (June 2021).

In this regard, Audit observed that:

(i) Blast Furnaces No. 1 and 2, having four stoves each for the purpose of blast heating, were commissioned during 1990 and 1992 respectively. The stoves had already outlived their lives of 12 to 15 years and were too old to meet the high Hot Blast Temperature requirements of Blast Furnaces No. 1 and 2. As blast furnace operation is a continuous process, all the stoves cannot be put down for repairs at a time. RINL should have utilized the opportunity of Category-I capital repairs of Blast Furnace No. 1 to revamp the stoves so that required blast temperature could be available after the Category-I capital repairs for enhanced hot metal production. However, RINL placed (August 2013) an order for revamping of stoves with a completion schedule of 30 months. The upgradation of one stove (Stove No. 2 of Blast Furnace No. 1) was yet to be completed (June 2021). This has resulted in non-availability of required blast after completion of capital repairs.

(ii) The Hot Blast Temperature is the most important parameter and frequently used to control the supply of thermal heat into the Blast Furnace. Hot Blast Temperature or higher thermal heat input decreases the total heat requirement generated in the furnace. Hot Blast Temperature is one of the enablers to enhance the pulverized coal injection. A rise in blast temperature of $10^0$C decreases the coke consumption rate by 1.23 kilogram per tonne of hot metal. The use of Hot Blast Temperature would result in saving of coke and increase in productivity. The delay in placement of order and execution resulted in low Hot Blast Temperature and consumption of coke at a higher rate.

Thus, delay in placement of order for revamping of stoves coupled with delay in executing the revamping of the stoves by the contractor resulted in non-availability of required blast temperature which, in turn, resulted in low productivity and high fuel consumption.

Management stated (March 2021) that life of stoves was nearing completion at the time when Category-I Capital Repairs to Blast Furnace No. 2 was to be taken up, hence revamp was taken up along with Category-I Capital Repairs of Blast Furnace No. 2. Further,

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[31] ***Stoves No. 1 and 2 of Blast Furnace No. 1 and Stove No. 5, 7 and 8 of Blast Furnace No. 2.***

[32] ***Stove No. 1 in September 2017, Stove No. 7 in October 2017, Stove No. 5 in February 2018 and Stove No. 8 in January 2021.***

normal time taken for repair of each stove is 9 to12 months whereas for furnaces this time is 4 to 6 months.

Ministry added (June 2021) that one of the important aspects of Blast Furnace operating philosophy is to maximize the life of equipment involved. Since the life expectancy of stoves of Blast Furnace No. 1 was still not over by the time Blast Furnace No. 1 was taken for capital repairs, it could not have been prudent to advance the revamping of stoves.

The replies are not acceptable as stoves considered for revamping were commissioned in the years 1990 and 1992 and had already outlived their life of 12 to 15 years at the time when Category-I capital repairs to Blast Furnace No. 1 were taken up. Further, performance of the furnace also depends on performance of the stoves and as replied by the Management to paras 1.6.6 and 1.6.7.1 below, one of the reasons for loss of production even after Capital Repairs was inadequacy of blast caused by absence of oxygen. It indicates that delay in revamping of stoves resulted in absence of the required blast with consequential loss of production.

### 1.6.4 Execution of works relating to revamping of Upstream and Downstream Plants

Category-I capital repairs of Blast Furnaces No. 1 and 2 was expected to enhance the production of hot metal by 1 million tonnes per annum. Therefore, it required additional sinter from Sinter Plant and coke from Coke Oven Batteries for the production of additional hot metal. Similarly, Steel Melting Shops were also required to be capable of processing the additional 1 million tonnes per annum hot metal available after Category-I capital repairs into liquid steel. Accordingly, RINL initiated proposals (2008/ 2009) for (i) commissioning of a new Coke Oven Battery to meet additional coke requirement; (ii) revamping the existing Sinter Plant to meet additional sinter requirement; (iii) revamping the existing Steel Melting Shop No. 1 and commissioning a new Converter and Caster for processing the liquid steel in Steel Melting Shop No. 2. However, there were delays in completion of these facilities as indicated below resulting in underutilisation of the production capacities of Blast Furnaces No. 1 and 2 after Category-I capital repairs.

#### 1.6.4.1 Delay in revamping of Sinter Plant-1

To meet the sinter requirement, a major input material required for Blast Furnace, RINL commissioned a Sinter Plant-1 with two Sinter Machines which were commissioned in 1989 and 1991 with initial liquid steel capacity of 3 million tonnes per annum. During expansion from 3 million tonnes per annum to 6.3 million tonnes per annum liquid steel, RINL commissioned (July 2013) a new Sinter Plant-2 with a rated capacity of 3.61 million tonnes per annum of sinter.

RINL placed (5 March 2014) a Letter of Intent on M/s Shriram EPC Limited for revamping and upgradation of Sinter Machines 1 and 2 at a cost of ₹250.31 crore with a completion schedule of 28 months from the effective date of contract which included shutdown period of 120 days each for Sinter Machines 1 and 2. As against the scheduled

completion date for revamping of Sinter Machine-1 of 22 April 2016, the actual revamping of Sinter Machine-1 was completed and commissioned on 17 August 2017 and Performance Guarantee test was completed on 15 December 2019. Sinter Machine-2 was yet to be revamped (December 2020).

Audit observed that RINL took around four years for invitation of tender (June 2012) from the date of receipt of Feasibility Report on Productivity Enhancement of Sinter Plant (May 2008) from M/s M N Dastur and Co. Due to inordinate delay in invitation of tender and placement of order (March 2014), RINL lost the opportunity to revamp Sinter Machine-1 during the shutdown of Category-I capital repairs of Blast Furnace No. 1 and the same was taken up during Category-I capital repairs of Blast Furnace No. 2. Revamp of Sinter Machine-2 was yet to be completed (December 2020). As a result of delay in revamping, RINL had to purchase 72,668 tonnes of sinter during the three years 2016-17 to 2018-19 from Neelachal Ispat Nigam Limited to meet the shortage. Since the cost of purchased sinter is higher than the cost of sinter produced in-house, RINL incurred additional expenditure of ₹4.92 crore.

The Management (March 2021) while agreeing on the delays stated (March 2021) that all efforts were put for finalization of the tender as early as possible to get the benefit of investment at early stage. However, some delay had occurred due to various extensions for receipt of offers, in resolving techno-commercial issues with tenderers, and price negotiations. Further, all efforts were put forward for timely completion of shutdown works to match with the shutdown schedule of Upstream and Downstream Plants. The revamping and upgradation of Sinter Machine-2 was partially completed.

The Ministry (June 2021) stated that Audit findings were noted for future implementation.

Even though Ministry has noted Audit findings for future implementation, responsibility needs to be fixed for inordinate delays which have already occurred resulting in additional expenditure of ₹4.92 crore.

### 1.6.4.2 Delay in Commissioning of new Coke Oven Battery

RINL has four Coke Oven Batteries for production of 2.45 million tonnes per annum of coke to meet the fuel requirement of three blast furnaces. After the Category-I capital repairs of Blast Furnaces No. 1 and 2, RINL had additional coke requirement of 0.45 million tonnes per annum with designed Pulverised Coal Injection[33] rate of 150 kilograms per tonne of hot metal. However, the shortfall of coke would be around 1 million tonnes per annum due to the non-availability of adequate oxygen and consumption of coke at a Pulverised Coal Injection rate much lesser than the envisaged 150 kilograms per tonne of hot metal. To meet the shortfall in coke requirement, RINL entered into a contract with M/s BEC and Ukraine Industrial and Financial Group consortium for supply and

[33] ***Coal in pulverised form (80% < 90 micrometer) is injected through Tuyeres and used as fuel to substitute costly coke.***

commissioning of Coke Oven Battery-5 and the same was commissioned in December 2020.

Audit observed that RINL was well aware (November 2008) of the shortfall in coke production compared to its requirement even for 6.5 million tonnes per annum of hot metal production which would increase further after Category-I capital repairs of Blast Furnaces No. 1and 2. Though RINL initiated the proposal to commission a new Coke Oven Battery in November 2008, it took 21 months for engaging (July 2010) a consultant for conducting the Feasibility Study and 42 months to appoint (May 2012) a Consultant for Project Management Consultancy. Similarly, there was also delay in awarding of the contract for Coke Oven Battery-5. It took 32 months to finalise order (May 2015) from the date of issue (September 2012) of tender. Thus, it took nearly seven years from initiation of proposal to the placement of order.

Delay in selection of consultant coupled with delay in placement of order contributed to delay in commissioning of Coke Oven Battery-5. As a result, there was shortfall in coke availability from own production after the Category-I capital repairs of Blast Furnaces No. 1 and 2. The shortage was met through purchase of 7,47,442 tonnes of coke from imported and indigenous sources during the years 2016-17 to 2019-20 at a cost higher than the cost of production in-house resulting in an additional expenditure of ₹788.60 crore.

Ministry (June 2021) and the Management (March 2021) stated that:

i) Preparation of Detailed Project Report took substantial time owing to issues of selection of technology, finalization of standby facilities, total manpower and other technological issues. The Detailed Project Report was approved by Board of Directors in December 2011 and contract for Project Management Consultancy was awarded in May 2012.

ii) Though the tender was invited in September 2012, it took considerable time due to the complaints lodged by the bidders. The work was awarded in July 2015 and Coke Oven Battery was commissioned in December 2020.

iii) The delays in execution of Coke Oven Battery-5 were also due to delay in ordering of Coal Chemical Plant, delay in handing over of front by RINL in certain areas, etc.

The replies are not tenable in view of the following -

(i) Board of Directors, while according in-principle approval (November 2008) for installation of Coke Oven Battery-5, stated that the new Coke Oven Battery should be commissioned by December 2012, as even with the operation of all the four batteries with full capacity, there would be shortage of coke. A Consultant for preparation of Detailed Project Report was engaged in July 2010 and Project Management Consultant was appointed in May 2012. Thus, RINL took as much as 42 months for engaging the consultants for Detailed Project Report and Project Management only, as against the

Board of Directors' anticipation of 48 months for commissioning of the new Coke Oven Battery.

(ii) Even if the delay in award of contract due to complaints lodged by the bidders is ignored, the delay in engaging the Consultants and delay in execution were avoidable which resulted in delay in commissioning of Coke Oven Battery-5.

(iii) Further, the reply indicates that there was lack of proper planning in execution of Coke Oven Battery-5 and the delays mentioned were avoidable, responsibility for which needs to be fixed and action taken.

### 1.6.4.3 Delay in revamping of three converters of Steel Melting Shop-1

As Steel Melting Shop-1 commissioned in 1990 had undergone several setbacks in converters and its associated equipment and it urgently required revamp to run safely, smoothly and reduce the drop in production, Board of Directors approved (August 2008) revamp and upgrade of the existing three converters. Accordingly, RINL placed (July 2012) orders on M/s SMS Siemag Consortium for revamping of Steel Melting Shop-1 at a total cost of ₹381.98 crore. After revamping, three converters were commissioned between March 2016 and May 2017.

Audit observed that a global tender was issued in June 2008 which had to be cancelled because of technical clarifications sought by the bidders. Subsequently, though a retender was issued in June 2009, after protracted clarifications on techno-commercial issues, the price bids were opened after lapse of three years in March 2012. As against the scheduled date of commissioning of three converters between April 2014 and July 2015, the three revamped converters were commissioned between March 2016 and May 2017. Thus, considering the approval of the Board obtained in August 2008, RINL took more than eight years for completing the revamp of converters. It was also observed that Blast Furnace No. 2 was under forced shutdown from August 2015 to May 2016 prior to commencement of Category-I capital repairs as well as from second week of February 2017 to 20 October 2017 subsequent to Category-I capital repairs. One of the reasons for the forced shutdown of Blast Furnace No. 2 was non-availability of converter.

Management attributed (March 2021) the delays to technical evaluation, scope finalisation as well as commercial evaluation as total revamping was first of its kind. Tender opening date was extended due to poor response and the probable tenderers sought extension of time. The revised price bids were opened in March 2012 and orders were placed in July 2012. The delay in execution was attributed to additional jobs which cropped up during the process of engineering.

The Ministry replied (June 2021) that though there was a delay in awarding the contract due to reasons beyond the control of RINL, the actual shutdown works carried out on the converters were not delayed and were completed within the stipulated shutdown duration. Therefore, the converters were available for production beyond the stipulated shutdown duration and there was no loss of production.

The replies need to be seen in the light of the fact that non-availability of converters was one of the main reasons for forced shutdown of Blast Furnace No. 2 prior to as well as post Category-I capital repairs and responsibility needs to be fixed for the delays.

### 1.6.4.4 Delay in commissioning of new converter and caster in Steel Melting Shop-2

With a view to convert the additional 1 million tonnes per annum of hot metal available after capital repairs into liquid steel, Board of Directors approved (February 2008) the proposal for commissioning of third converter and fourth caster of Steel Melting Shop-2. RINL entered into two separate agreements for new converter (March 2013) and new Continuous Casting Machine (June 2014) with a commissioning schedule of 28 months (i.e., June 2015) and 25 months (i.e., by June 2016) respectively. The new converter and new Converter Casting Machine in Steel Melting Shop-2 were commissioned in November 2016 and December 2017 respectively.

In this regard, Audit observed that -

(i) Though the proposal was approved in February 2008, the consultant was appointed in November 2010 and the contract for converter and caster was awarded in March 2013/ June 2014. Thus, it took more than five years from initiating the proposal to entering into contracts.

(ii) One of the objectives for commissioning of new converter and caster was to convert the additional production of 1 million tonnes per annum of hot metal into liquid steel after the Category-I capital repairs. The Category-I capital repairs of Blast Furnace No. 1 were completed in July 2014. However, due to poor off-take, Blast Furnace No. 2 was blown-out from August 2015 whereas it was handed over for Category-I capital repairs in May 2016. Had the new converter and caster been ready by that time, blow-out of Blast Furnace No. 2 in August 2015 could have been avoided. This also could have avoided the loss of production as discussed in Para 1.6.5 below.

(iii) Further, Blast Furnaces No. 1 and 2 were operated under restricted regime due to difficulty in distribution of hot metal at Steel Melting Shop for 3,635.45 hours resulting in loss of production of 10,68,196 tonnes of hot metal valuing ₹365.56 crore.

Ministry (June 2021) and the Management (March 2021) stated that -

(i) The approval of Board of Directors (February 2008) for setting up one more converter and Continuous Casting Machine to meet the additional hot metal requirement after Category-I capital repairs was reviewed (February 2009) again considering cost reduction under the then prevailing economic scenario. A committee formed to review the decision also recommended for installation of new converter and caster. M/s MECON, engaged (November 2010) as consultant, revisited the configuration and submitted an approach note. M/s MECON, after detailed study of all the aspects, recommended to change the configuration of Caster No. 4 to combi caster to produce billets/ rounds/ blooms in place of a billet caster producing billets. Board of Directors approved the same in July 2011 with a completion schedule of 30 months from date of signing of agreement.

Lapse of time in obtaining approvals was for competitive bidding to reduce cost and for betterment of the product mix.

(ii) Global tenders were issued in January 2011 and December 2011 for converter and caster respectively. In respect of converter, the technical bids and price bids were opened in May 2011 and December 2012 respectively and the order was placed in March 2013. The technical bids and price bids for caster were opened in March 2012 and July 2013 respectively and order was placed in February 2014. The delay in placing orders was due to resolving techno-commercial issues with tenderers.

The replies are not tenable in view of the following:

i) RINL was well aware of the requirement of additional converter and caster to process the additional hot metal after Category-I capital repairs. Despite this, it took 33 months from the date of Board of Directors' approval to engage a consultant for Project Management. Further, the long lapse of time was not only for obtaining competitive bidding but also due to indecisiveness on the part of RINL, which was evident from the fact that RINL could not freeze scope and technical specifications with reference to the caster and converter configurations before obtaining initial approval of the Board in February 2008. Market study was conducted subsequently and based on that study and recommendations of the consultant, product mix was changed and revised approval of the Board was obtained in July 2011.

(ii) Though global tender for converter was issued in January 2011, the order was placed in March 2013. Similarly, though global tender for caster was issued in December 2011, the order was placed in February 2014. Thus, RINL took more than two years for processing the tender for commissioning of new converter and caster. RINL was aware that the production of hot metal will increase by 1 million tonnes per annum after Category-I capital repairs of Blast Furnaces No. 1 and 2. However, there was delay of around three years for converter and four years for caster for invitation of tender from the date of initiation of proposal (February 2008).

Thus, commissioning of new converter and caster behind schedule resulted in operation of the Blast Furnace No. 1 at a lower capacity after the Category-I capital repairs and blow out of Blast Furnace No. 2 due to poor off take by Steel Melting Shop with consequential loss of production of hot metal of 10,68,196 tonnes.

As can be seen from the above, a common reason for delays in revamping of various Upstream and Downstream units is the delay in finalization of tenders. This delayed execution of revamping works. As facilities were not sufficient to handle the increased production capacity after Capital Repairs, the Blast Furnaces were operated in restricted regime resulting in loss of production as discussed in Para No. 1.6.7.1.

***Recommendation No. 5: Holistic Planning needs to be done to ensure revamping of all the upstream/ downstream facilities in synchronization with upgradation of main plants/ blast furnaces. Special efforts are required to be made to reduce delays in***

***finalization of terms of tenders, resolving techno-commercial issues, tender evaluation and resultant delays in placement of orders to ensure timely execution of planned activities. Responsibility also needs to be fixed in all the areas of inordinate delays in execution.***

### 1.6.5 Forced shutdown of Blast Furnace No. 2

As per the order placed (August 2013) for Category-I Capital Repairs of Blast Furnace No. 2, the entire work had to be completed in 23 months, i.e., by July 2015. The shutdown work was scheduled to commence on 28 February 2015 and was to be completed by 28 July 2015. However, as mentioned in para 1.6.2.2 (ii) there were major delays in pre-shut down as well as shutdown activities.

Further, after commissioning of Blast Furnace No. 1 post Category-I capital repairs, three furnaces were in operation under restricted regime mainly due to poor off take. Due to restricted operations, furnaces were being subjected to forced shutdown frequently. This was taking its toll on the health of the furnaces, particularly that of Blast Furnace No. 2 which was long overdue for capital repairs. Instances of burning of cooling elements had also gone up in the Blast Furnace No. 2. As a result, proposal to shut down Blast Furnace No. 2 from August 2015 was approved (July 2015) and this furnace had to remain under forced shutdown from 23 August 2015 to 2 May 2016 before it was handed over to the contractor for Category-I capital repairs.

Though Blast Furnace No. 2 was ready for commencement in the second week of February 2017 post Category-I capital repairs, its blow-in was also delayed considering that the production of hot metal from the two furnaces viz., Blast Furnaces No. 1 and 3 was more than the consumption at Steel Melting Shop and the commissioning delays of Upstream Plants (viz., Sinter Machine No. 1) and Downstream Plants (viz., Converter B of Steel Melting Shop No. 1 and Caster No. 4 of Steel Melting Shop No. 2). A proposal was, therefore, initiated (2 February 2017) to review the decision of commencement of Blast Furnace No. 2 from second week of February 2017. It was decided (10 May 2017) to commission Blast Furnace No. 2 by 30 June 2017 after revamp of Sinter Machine No. 1 and commissioning of new converter in Steel Melting Shop No. 2. However, the actual commissioning was done on 21 October 2017.

Audit observed that the reason for forced shutdown of Blast Furnace No. 2 prior to commencement of capital repairs as well as post completion of Category-I capital repairs was non-availability of Downstream and Upstream Plants on account of delays at various stages. Considering the rated capacity of Blast Furnace No. 2, the loss of production due to forced shutdown of the Furnace worked out to 23,58,940 tonnes. Considering the earnings computed by Cost Monitoring Group for every increase of one *per cent* in hot metal production (as mentioned at para 1.6.1.2 (ii) *supra*), the loss of earnings due to forced shutdown of Blast Furnace No. 2 was ₹810.38 crore.

Management stated (March 2021) that since commissioning of Blast Furnace No. 1 in July 2014 after capital repairs, three furnaces were in operation in restricted regime/ under forced shut down due to reduced availability of converters owing to pending capital repairs and converter relining. The restricted production schedule resulted in higher thermal regime[34] which in turn increased coke consumption rate with lower productivity. Considering the techno-economics parameter, the Blast Furnace No. 2 was put under forced shutdown.

The Ministry added (June 2021) that the planning for revamping of existing facilities and commissioning of new facilities at RINL was proper, however, the execution could not take place at the desired pace because of the delay in commissioning and stabilization of Steel Melting Shop No. 2.

The reply of the Management itself confirms the fact that there was non-synchronization of various upgradation activities due to which RINL could not reap the benefit of its increased hot metal production capacity even after installation of Blast Furnace No. 3 and Capital Repairs to Blast Furnaces No. 1 and 2. Audit findings given under para 1.6.4 also highlight instances of lack of proper planning as well as execution in revamping of downstream units to process the additional hot metal after Category-I capital repairs leading to a loss of earnings of ₹810.38 crore due to forced shutdown of Blast Furnace No. 2.

### 1.6.6 Performance Guarantee tests

RINL placed (February 2011 and August 2013) two separate orders on consortium of M/s Siemens VAI (presently M/s Primetals) for conducting the Category-I capital repairs of Blast Furnace No. 1 and Blast Furnace No. 2. As per the terms of the agreements signed, within seven days of completion of commissioning, the Preliminary Acceptance Certificate shall be issued along with various defects/ deficiencies noticed during commissioning. After rectification of defects, the Performance Guarantee tests (for three days in continuation) were to be conducted. The Plant was deemed to have concluded the Performance Guarantee Test satisfactorily, if during the entire duration of the test, the Plant had delivered the guaranteed specified output or operated at the specified capacity utilising specified quantity of raw materials, utilities, fuel, supplies, etc., as guaranteed by the contractor. On satisfactory completion of Performance Guarantee Test, the Provisional Acceptance Certificate was to be issued. After successful completion of Performance Guarantee Tests and establishing that the Plant was capable of producing reliably and on regular basis under normal operational conditions for a period of six months from the date of issue of Provisional Acceptance Certificate, Final Acceptance Certificate was to be issued. Performance Guarantee Tests were to be completed within 26 months (Blast Furnace No. 1) and 27 months (Blast Furnace No. 2) from signing of the respective contracts, i.e., by April 2013 for Blast Furnace No. 1 and by November 2016 for Blast Furnace No. 2.

[34] ***Higher Thermal Regime is when the furnaces are operated at temperatures higher than the average.***

Blast Furnace No. 1 commenced its operations from 31 July 2014 after Category-I capital repairs and was issued Preliminary Acceptance Certificate on 9 August 2014. However, the Performance Guarantee tests were conducted in April 2020 and Provisional Acceptance Certificate was issued on 8 January 2021. Final Acceptance Certificate for Blast Furnace No. 1 was yet to be issued (June 2021) which indicates that guaranteed specified output utilising specified quantities of raw materials was not achieved. An amount of ₹18 crore has been withheld for release of Final Acceptance Certificate. Similarly, Blast Furnace No. 2 commenced operations after Category-I capital repairs from 23 October 2017. Preliminary Acceptance Certificate for Blast Furnace No. 2 was issued on 17 November 2017 and Performance Guarantee tests were conducted in November 2019. Provisional Acceptance Certificate was issued on 15 November 2019 and Final Acceptance Certificate for Blast Furnace No. 2 was also yet to be issued (June 2021). An amount of ₹32.88 crore[35] has been withheld for release of Final Acceptance Certificate.

Audit observed that -

i) Though Blast Furnace No. 1 commenced operations from 31 July 2014 and Preliminary Acceptance Certificate was issued on 9 August 2014, Performance Guarantee tests were conducted in April 2020 after a delay of nearly six years from Preliminary Acceptance Certificate. Blast Furnace No. 1 was operated 1,868 days[36] after Category-I capital repairs up to 31 March 2020. After capital repairs, the daily rated capacity of 7,150 tonnes of hot metal was achieved only on two days (i.e., on 30 June 2017 and 1 December 2017) up to 31 March 2020. The average daily production of Blast Furnace No. 1 after Category-I capital repairs was 4,847 tonnes. Final Acceptance Certificate for Blast Furnace No. 1 was yet to be issued as mentioned above.

ii) Despite commencement of operations of Blast Furnace No. 2 from 23 October 2017 after Category-I capital repairs, Performance Guarantee tests were conducted in November 2019 after a delay of nearly two years and Provisional Acceptance Certificate was issued on 15 November 2019. The average daily production of hot metal after Category-I capital repairs in Blast Furnace No. 2 was 4,902 tonnes. After conducting the Performance Guarantee tests and issue of Provisional Acceptance Certificate, the daily production exceeded the guaranteed norm of 7,150 tonnes per day only on 20 days between the period from November 2019 till 31 March 2020.

iii) The guaranteed norm for Pulverized Coal Injection was 150 kilograms per tonne of hot metal. However, during the Performance Guarantee tests, RINL could not supply the required pulverised coal to test the guaranteed parameter for fuel consumption. In the absence of pulverised coal, the test was conducted with Blast Furnace Coke and the

[35] ***Includes an amount of ₹ 8.08 crore for repair of Stoves.***
[36] ***Excluding 203 days, where there was no production.***

contractor achieved the guaranteed parameter on theoretical basis[37]. The guaranteed norm of consumption of pulverised coal at 150 kilograms per tonne of hot metal was yet to be achieved for Blast Furnaces No. 1 and 2 (June 2020).

Thus, the abnormal delay in conducting the Performance Guarantee tests defeated the very objective of conducting the Performance Guarantee tests to assess the capability of Blast Furnaces No. 1 and 2 after Category-I capital repairs to meet the performance criteria as specified in the contracts.

Management stated (March 2021) that it has furnished the defect list along with Preliminary Acceptance Certificate to M/s Primetals Consortium for liquidation of the defects. The contractor was to perform Performance Guarantee tests after liquidating the defects as per the terms and conditions of the Contract. After liquidation of the defects, the major reasons for not achieving guaranteed performance of Blast Furnaces No. 1 and 2 were limited availability of oxygen and non-receipt of required hot blast due to problems in Hot Blast Main Compensator. Ministry endorsed (June 2021) the Management's reply.

The reply of the Management is not acceptable. Though Preliminary Acceptance Certificate for Blast Furnace No. 1 was issued on 9 August 2014, the Performance Guarantee tests were conducted in April 2020, after nearly six years. Operation of the plant without rectification of defects for a period of six years was not justified for which responsibility needs to be fixed. Similarly, Performance Guarantee tests for Blast Furnace No. 2 were conducted after two years from Preliminary Acceptance Certificate. The reasons stipulated by Management for not achieving the guaranteed performance are also not acceptable. Had RINL made available the required oxygen and revamped the stoves along with Blast Furnaces No. 1 and 2 capital repairs, the required hot blast for operating the furnace stoves would have been available.

### 1.6.7 Performance after Category-I capital repairs

The performance of Blast Furnace No. 1 and Blast Furnace No. 2 after the Category-I capital repairs was reviewed against the envisaged objectives and following was observed:

#### 1.6.7.1 Loss of production of hot metal

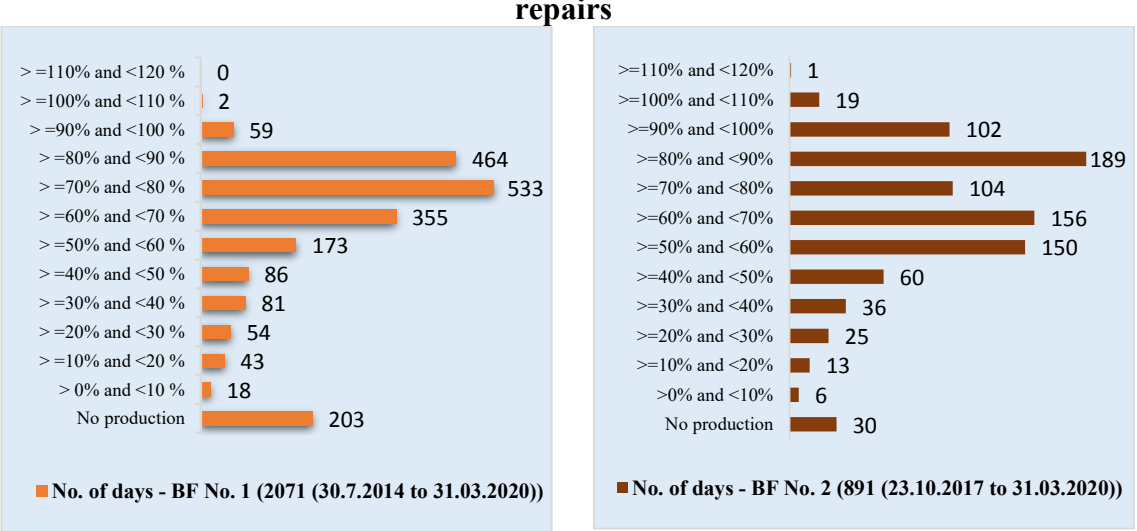
As per the agreement with M/s Primetals, the guaranteed capacity of hot metal production was 7,150 tonnes per day each for Blast Furnaces No. 1 and 2 after Category-I capital repairs. Blast Furnaces No. 1 and 2 commenced operations from 31 July 2014 and 23 October 2017 respectively after Category-I capital repairs. Audit observed that the average daily production after Category-I capital repairs of Blast Furnace No. 1 and Blast Furnace No. 2 was much below the guaranteed production of 7,150 tonnes. The average daily production[38] of Blast Furnace No. 1 and Blast Furnace No. 2 was 67.79 *per cent* (31 July 2014 to 31 March 2020) and 68.56 *per cent* (23 October 2017 to 31 March 2020)

[37] ***Actual operational parameters with regard to Coke Ash, Hot Blast Temperature, Pulverised Coal Injection rate and humidity were in deviation to agreed parameters and hence, were factored to derive the fuel rate.***

[38] ***The percentage was worked out excluding the 'nil' production days for both the blast furnaces.***

respectively of the guaranteed production capacity. The chart below depicts the daily production of hot metal from Blast Furnaces No. 1 and 2 after Category-I capital repairs against percentage of rated capacity.

**Chart 1.3: Performance of Blast Furnaces No. 1 and 2 after Category-I capital repairs**




It could be observed from the above chart that the production of hot metal from Blast Furnace No. 1 was between 70 *per cent* and 80 *per cent* of its rated capacity on 533 days. Production of hot metal from Blast Furnace No. 2 was between 80 *per cent* and 90 *per cent* of its rated capacity on 189 days after the Category-I capital repairs.

In this regard, Audit observed that:

i) Blast Furnace No. 1 was not operated for 203 days constituting about 10 *per cent* of the available days owing to scheduled maintenance/ repairs and *force majeure*[39] circumstances.

ii) Of the balance 1,868 days of operation of Blast Furnace No. 1 after Category-I capital repairs from 31 July 2014 to 31 March 2020, it achieved the rated capacity only on two days. The operation was more than 90 *per cent* of the rated capacity on 61 days (i.e., 2.94 *per cent* of the total days available).

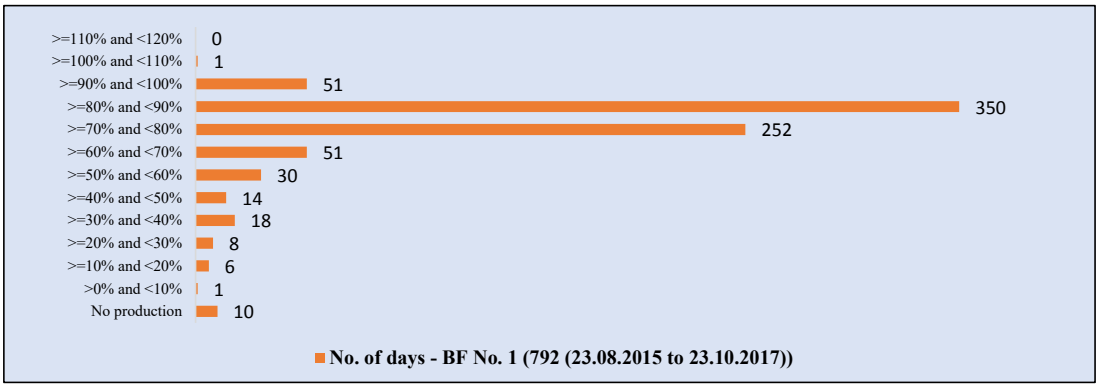
iii) Similarly, Blast Furnace No. 2 was operated for 891 days after Category-I capital repairs since 23 October 2017 up to 31 March 2020. However, production from Blast Furnace No. 2 was more than the rated capacity on 20 days and the operation was more than 90 *per cent* of the rated capacity on 122 days (i.e., 13.69 *per cent* of the total days available).

iv) Blast Furnace No. 2 was under forced shutdown from 23 August 2015 prior to being given for Category-I capital repairs. Blast Furnace No. 1 was operated for 792 days during Blast Furnace No. 2 shutdown period up to 23 October 2017. As only two out of three blast furnaces were running at this time, constraints of input material and capacity of

[39] ***Cyclone Hudhud, Covid Lockdown etc.***

downstream units would not have been there, so Blast Furnace No. 1 should have been able to achieve its rated capacity during this time. However, Audit observed that Blast Furnace No. 1 attained the rated capacity on only one day and performed less than 90 *per cent* during 740 days (93.43 *per cent*) as indicated below.

**Chart 1.4: Performance of Blast Furnace No. 1 during capital repairs of Blast Furnace No. 2**




v) After the Category-I capital repairs of Blast Furnaces No. 1 and 2, the production of hot metal from the two furnaces was to increase by 1 million tonnes per annum with corresponding increase in sinter requirement by 1.1 million tonnes per annum. It was noticed that Blast Furnaces No. 1 and 2 were operated under restricted regime for 5,423.51 hours on account of shortage of Sinter (4,217.18 hours-77.76 *per cent*), Iron Ore (221.09 hours), Coke (187 hours) and Oxygen (798.24 hours) after Category-I capital repairs. To meet the shortage of sinter, RINL purchased 72,668 tonnes of sinter during the years 2017-18 to 2019-20 from M/s Neelachal Ispat Nigam Limited resulting in additional expenditure of ₹4.92 crore as mentioned in Para 1.6.4.1. Further, operation of the furnaces at restricted regime also resulted in higher fuel consumption with lower productivity.

vi) RINL was also aware that it requires additional cold blast[40] air for production of 1 million tonnes per annum of additional hot metal after Category-I capital repairs to Blast Furnaces No. 1 and 2 and cold blast air from Turbo Blowers No. 1, 2 and 3 was not sufficient to meet the additional hot metal production. Hence, RINL belatedly initiated action (April 2017) to interconnect the new Turbo Blowers No. 4 and 5 connected to Blast Furnace No. 3 with Cold Blast Header of Turbo Blowers No. 1 and 2 after completion of Category-I capital repairs of Blast Furnaces No. 1 and 2. Belated action to interconnect Turbo Blowers No. 4 and 5 with Cold Blast Header of Turbo Blowers No. 1 and 2 has resulted in operation of Blast Furnaces No. 1 and 2 at restricted regime[41] for 6,422.09

[40] ***Air blown from Turbo Blowers available at Thermal Power Plant is called Cold Blast. Its temperature varies from 80 to 150 degree C. Cold blast enters the stoves and is heated to a temperature of 1,000 to 1,300 degree C and heated air at the exit of the stoves is Hot Blast which is blown into the Blast Furnace.***

[41] ***Work on inter connection of Turbo Blowers was completed in May 2020.***

hours and, consequently, there was loss of production of 7,19,715 tonnes of hot metal due to non-availability of cold blast air during the years[42] 2015-16 to 2019-20.

Thus, the production of hot metal was less than the rated capacity due to non-availability of sinter from Sinter Machines, coke from Coke Oven Batteries, low hot blast temperature from stoves etc. The delay in commissioning/ revamping of Downstream and Upstream units also contributed to operation of Furnaces at a low level resulting in loss of production.

Thus, due to operation at a lower level than rated capacity after Category-I capital repairs, RINL suffered an overall loss of production of 49,29,046 tonnes of hot metal from Blast Furnaces No. 1 and 2. This has resulted in loss of earnings of ₹1,844.82 crore[43] considering the rate of earnings due to increase in hot metal production assessed by Cost Monitoring Group of RINL.

Management attributed (March 2021) the operation of blast furnaces at restricted regime to shortage of sinter/ iron ore/ coke which was due to supply issues on account of conveyor maintenance and logistics management of Upstream Units. The production was also low due to inadequacy of blast in the absence of oxygen.

The Management's reply is not acceptable since the shortage of sinter/ iron ore/ coke/ oxygen due to supply issues on account of conveyor maintenance and logistics management of Upstream Units, could have been avoided through better planning.

### 1.6.7.2 Consumption of fuel

RINL entered into (February 2011 and August 2013) contracts with Consortium of M/s Siemens VAI and M/s Siemens Plc, UK (presently M/s. Primetals) for conducting the Category-I capital repairs of Blast Furnaces No. 1 and 2 respectively. Both the contracts included a guaranteed parameter for consumption of fuel at 535 kilograms per tonne of hot metal including coke consumption of around 385-390 kilograms per tonne of hot metal and Pulverised Coal Injection rate of around 150 kilograms per tonne of hot metal. RINL commissioned the Pulverised Coal Injection system in Blast Furnace No. 1 (March 2015) and Blast Furnace No. 2 (December 2015) to replace a part of high value coke and also to improve hot metal productivity. A coal injection rate of 150 kilograms per tonne of hot metal with five *per cent* oxygen enrichment[44] of air blast and hot blast temperature of 1,150–1,200$^0$C had been considered.

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[42] ***There was no shortage of blast in Blast Furnace No. 1 during 2014-15 after Category-I capital repairs.***

[43] ***₹1,844.82 crore depicts the difference between production that should have been achieved at rated capacity and the production actually achieved after Category-I Capital Repairs.This includes ₹365.56 crore as mentioned in para 1.6.4.4 towards loss of production of hot metal of 10,68,196 tonnes due to poor off take by Steel Melting Shop.***

[44] ***Oxygen enrichment is done in cold blast/ hot blast by mixing pure oxygen (2 to 8 per cent) with air to increase the oxygen content in the Blast to facilitate burning of auxiliary fuel like Pulverised Coal Injection in front of tuyeres. This increases the productivity of the furnace and reduces the hot metal cost.***

Charts 1.5 and 1.6 depict the consumption of Coke and Pulverised Coal respectively after Category-I capital repairs of Blast Furnaces No. 1 and 2.

**Chart 1.5: Consumption of Coke after Category-I Capital Repairs (Kilogram per tonne of hot metal)**

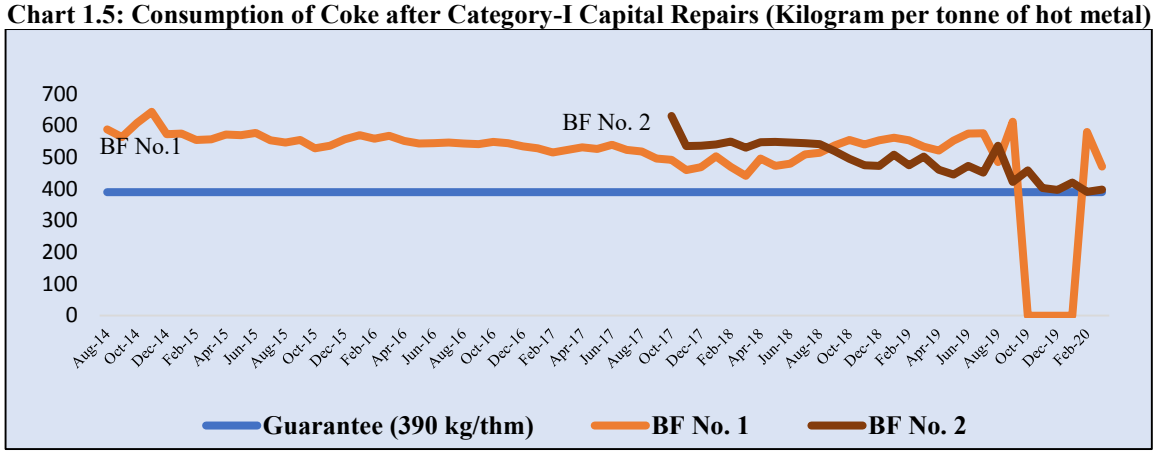
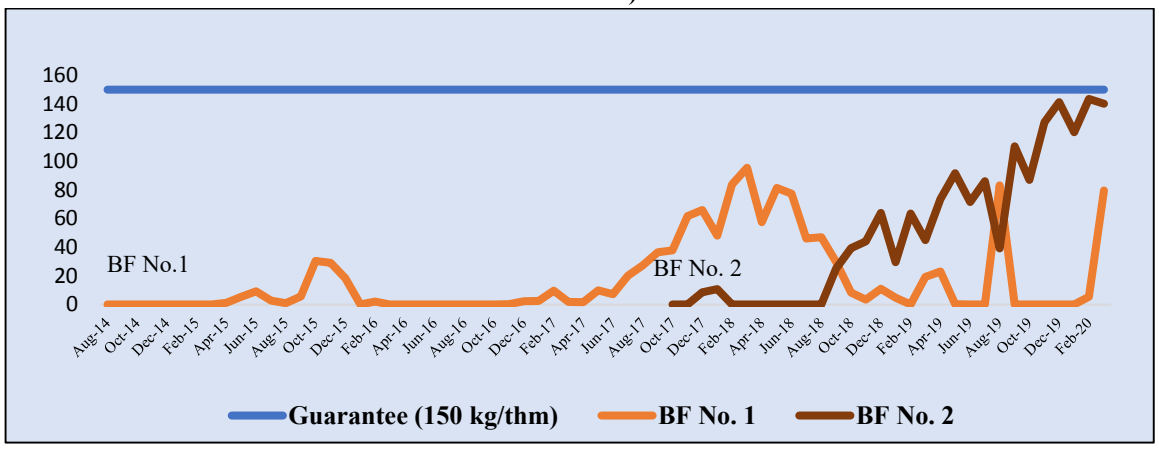



**Chart 1.6: Consumption of Pulverised Coal after Category-I Capital Repairs (Kilogram per tonne of hot metal)**




Audit observed following with respect to consumption of different fuels-

**i) Pulverised coal**: RINL could not inject pulverised coal at the maximum guaranteed rate of 150 kilograms per tonne of hot metal after Category-I capital repairs till March 2020 as explained below:

- Blast Furnace No. 1 consumed 'Nil' pulverised coal in 25 out of 68 months of its operations post Category-I capital repairs. Minimum consumption of pulverised coal in this furnace was 0.20 kilograms[45] per tonne of hot metal in the month of November 2016 whereas maximum consumption was 95.60 kilograms per tonne of hot metal in March 2018. Average consumption in this furnace was 17.59 kilograms per tonne of hot metal.

- Similarly, Blast Furnace No. 2 consumed 'Nil' pulverised coal in 9 out of 30 months of its operations post Category-I capital repairs. Minimum consumption was 8.50 kilograms per tonne of hot metal in December 2017 whereas maximum consumption was

[45] ***Excluding the months in which no pulverised coal was injected.***

143.50 kilograms per tonne of hot metal in February 2020. Average consumption remained at 52.06 kilograms per tonne of hot metal in this furnace.

- Injection of pulverised coal at a rate less than the norm resulted in non-achievement of the intended benefit of savings. The shortfall in pulverised coal consumption was met through consumption of coke at higher cost resulting in consumption of 12,80,388 tonnes of higher cost coke with additional cost of ₹1,279.69 crore.

**ii) Coke:** The consumption of coke in excess of the guaranteed parameter (535 kilograms per tonne of hot metal) after completion of Category-I capital repairs of Blast Furnaces No. 1 and 2 was 1,71,092.56 tonnes and 25,444.20 tonnes respectively. Considering the actual cost of production of coke in-house, the additional expenditure incurred due to consumption of fuel in excess of guaranteed parameters works out to ₹303.78 crore and ₹50.31 crore for Blast Furnaces No. 1 and 2 respectively. One of the reasons for this excess consumption of coke was operation of Blast Furnaces No. 1 and 2 at restricted regime.

**iii) Oxygen Enrichment and Hot Blast temperature:** The oxygen enrichment was less than the anticipated norm of 5 *per cent* for both Blast Furnaces No. 1 and 2. The actual enrichment ranged between 0.88 *per cent* (2019-20) and 2.18 *per cent* (2018-19) for Blast Furnace No. 1 and between 0.92 *per cent* (2017-18) to 3.31 *per cent* (2019-20) for Blast Furnace No. 2.

The hot blast temperature was also less than the required temperature of $1,150^0$C–$1,200^0$C for both Blast Furnaces No. 1 and 2. For Blast Furnace No. 1, it ranged between $838^0$C to $988^0$C and for Blast Furnace No. 2 it ranged between $917^0$C to $1015^0$C during 2017-18 to 2019-20. Non-availability of required oxygen enrichment and hot blast were major reasons for non-infusion of pulverised coal at the anticipated rate.

Thus, RINL consumed 1,96,536.76 tonnes of coke valuing ₹354.09 crore in excess of the parameter guaranteed (535 kilograms per tonne of hot metal) by the contractor in Category-I capital repairs of Blast Furnaces No. 1 and 2 and consumed 12,80,388 tonnes of high cost coke instead of infusing low cost pulverised coal resulting in additional cost of ₹1,279.69 crore.

Management stated (March 2021) that consumption of fuel for hot metal production is directly proportional to consistent and steady state of operation of blast furnace. The desired fuel rate could not be achieved because Blast Furnaces No. 1 and 2 were forced to operate in restricted regime due to limited oxygen supply to step up pulverised coal, low blast temperature, etc. Ministry, in its reply, added (June 2021) that as per the Expansion Plan, the Air Separation Plant on Build Own Operate basis could not come up due to legal entanglement with the supplier M/s Air Liquide India Holding Private Limited, which has resulted in oxygen deficit in the Plant.

The replies need to be seen in light of the fact that had RINL arranged the required oxygen through purchase and ensured blast temperature by timely repair/ revamp of stoves and injected pulverised coal at the required level, fuel consumption would have been at the optimum level and the Company could have avoided the consumption of fuel in excess of norms. Further, even though the legal entanglement with the supplier, viz., M/s Air Liquide India Holding Private Limited was still continuing (June 2021), oxygen enrichment has increased from 0.92 *per cent* in 2017-18 to 3.31 *per cent* in 2019-20 in case of Blast Furnace No. 2 which indicates that the shortage of oxygen was due to lack of planning in meeting the oxygen requirement of blast furnace and not due to the legal entanglement with M/s Air Liquide India Holding Private Limited.

***Recommendation No. 6: Necessary steps may be taken to make available the required input raw material to operate the furnaces at their rated capacities and also ensure consumption of pulverised coal at the desired level of 150 kilograms per tonne of hot metal to achieve optimum production level. A periodic compliance report in this regard may be sent by the Company to the Board and the Ministry.***

### 1.6.8 Monitoring of Category-I capital repairs

RINL engaged M/s M N Dastur and Co. as Consultant for 'Project Management Consultancy' services for Category-I capital repairs of Blast Furnaces No. 1 and 2. As per the terms of the agreement of Consultancy contract, M/s M N Dastur and Co. had to prepare the detailed consolidated baseline schedules based on the information submitted by contractors.

Audit reviewed the Monthly Progress Reports submitted by M/s M N Dastur and Co. and observed that the Progress Reports included the status of work and cost-related information such as details of awarded value of works and cumulative expenditure till the end of the corresponding month. This apart, the status of work was regularly put up to the Board of Directors. It was noted that presentations on the actual status of the project vis-à-vis the schedule, along with action plans, were made to the higher management of RINL. However, copies of the presentations made to higher management were not furnished to Audit.

Despite the existence of a Consultant to monitor the execution of the Project and follow-up by the higher management of RINL, Audit noticed delays in execution of Main Packages as well as Auxiliary Packages of Category-I capital repairs of Blast Furnaces No. 1 and 2 indicating the need to strengthen the monitoring mechanism and arrest the delays in implementation of capital repairs works.

Ministry (June 2021) and the Management (March 2021) stated that:

i) Detailed consolidated baseline schedules were prepared by M/s M N Dastur and Co., weekly/ monthly review meetings were held with contractors, daily meetings were held during shutdown and plan vis-à-vis actual status was communicated to the contractors. In addition, presentations were made to the higher management.

(ii) Category-I capital repairs of Blast Furnaces No. 1 and 2 were voluminous, complex and bound to be carried out within stipulated shutdown period. There were several works undertaken, beyond the actual scope and as a result, it led to more time beyond the contractual time. Further, in view of the interdependence of engineering, erection and testing between main and auxiliary packages, there occurred delays, which are beyond the control of RINL. However, in view of the effective monitoring and coordination, these delays could be minimised.

The replies are not tenable as against plan to conduct Category-I capital repairs of both Blast Furnaces No. 1 and 2 in the year 2010, the entire process of Category-I capital repairs of both the blast furnaces were completed with significant delays. Besides, there were loss of earnings and additional costs were incurred totaling ₹6,665.80 crore[46] as already pointed out in detail in the preceding paras. Further, non-synchronization of revamping and upgradation of Upstream and Downstream Plants and delays in project works due to issues in logistics, etc., all point out towards weaknesses in the monitoring system.

***Recommendation No. 7: Project monitoring mechanism at Board level needs to be strengthened in all the areas right from conceptualization of the project, placement of orders till execution of the Project to ensure timely completion of all the envisaged Projects. For this purpose, submission of reports to the Board at least on quarterly basis on progress of all major projects may be ensured.***

## 1.7 Conclusion

Blast Furnaces No. 1 and 2 of RINL were commissioned in March 1990 and March 1992 under the supervision of M/s Gipromez, Russia. Certain norms were prescribed by M/s Gipromez, Russia for the periodicity and type of capital repairs. Audit on Category-I capital repairs, which are major repairs, of these furnaces revealed various deficiencies at planning as well as execution stages.

There was delay of 8 to 9 years in taking up the Category-I capital repairs, which resulted in deterioration of the hearth of furnaces. Due to this, furnaces were operated under restricted regime and there was loss of production of 1.78 million tonnes of hot metal from 2011-16 with consequential loss of earnings of ₹1,396.64 crore. RINL could have produced additional 7.51million tonnes of hot metal had it carried out Category-I repairs of Blast Furnaces No. 1 and 2 in the year 2010 itself as planned. Non-achievement of this production capacity represents loss of potential earnings of ₹3,865.05 crore.

In case of repairs related to Blast Furnace No. 1, the works stipulated in the Feasibility Report for conducting the Category-I capital repairs of Blast Furnace No. 1 were divided into two separate packages of less than ₹500 crore to bypass the need for obtaining the

[46] ***₹1,396.64 crore, ₹107.60 crore, ₹54.95 crore (Para 1.6.1), ₹18.14 crore, ₹5.97 crore (Para 1.6.2), ₹4.92 crore, ₹788.60 crore (Para 1.6.4), ₹810.38 crore (Para 1.6.5), ₹1,844.82 crore, ₹1,279.69 crore and ₹354.09 crore (Para 1.6.7).***

approval of the Government of India, as per the delegation of powers at that time. There were delays in execution of Main Package as well as Auxiliary Packages of Category-I capital repairs of Blast Furnaces No. 1 and 2 despite the existence of a consultant to monitor the execution of the Project and follow-up by the higher management of RINL, which suggests weaknesses in the monitoring mechanism. Subsequently, after the completion of Category-I capital repairs, there was loss of production of 4.93 million tonnes of hot metal with consequential loss of earnings of ₹1,844.82 crore as the blast furnaces were not utilised to their rated capacities mainly due to non-synchronization of revamping of other upstream/ downstream facilities. Also, there was loss of production of 2.36 million tonnes of hot metal with consequential loss of earnings of ₹810.38 crore due to forced shutdown of Blast Furnace No. 2 due to non-integration of Upstream and Downstream Plants. Thus, in total, there was loss of production of 7.29 million tonnes of hot metal with consequential loss of earnings of ₹2,655.20 crore. There was delay in initiation of tenders/ award of contracts for Upstream and Downstream Plants resulting in mismatch between the production capacities of different units. Consequently, there was shortage of sinter and coke from Sinter Plants and Coke Oven Batteries, respectively. This also resulted in additional cost towards coke procurement amounting to ₹788.60 crore. Fuel consumption was higher than the guaranteed norms resulting in additional cost towards increased consumption of coke amounting to ₹354.09 crore. Further, reduced infusion of pulverised coal resulted in additional cost of ₹1,279.69 crore.

Thus, it can be seen that planning for capital repairs of Blast Furnaces No. 1 and 2 was not made holistically considering the increased requirement of raw material as well as downstream facilities to process enhanced production of hot metal from blast furnaces after Category-I capital repairs. Further, significant delays in carrying out these repairs coupled with non-synchronization of revamping of upstream and downstream facilities led to significant loss of production and earnings totaling ₹6,665.80 crore prior to as well as after conducting of these repairs. Delays in execution of main as well as all the auxiliary packages for capital repairs of both the furnaces clearly indicates the deficiencies of monitoring mechanism of RINL.

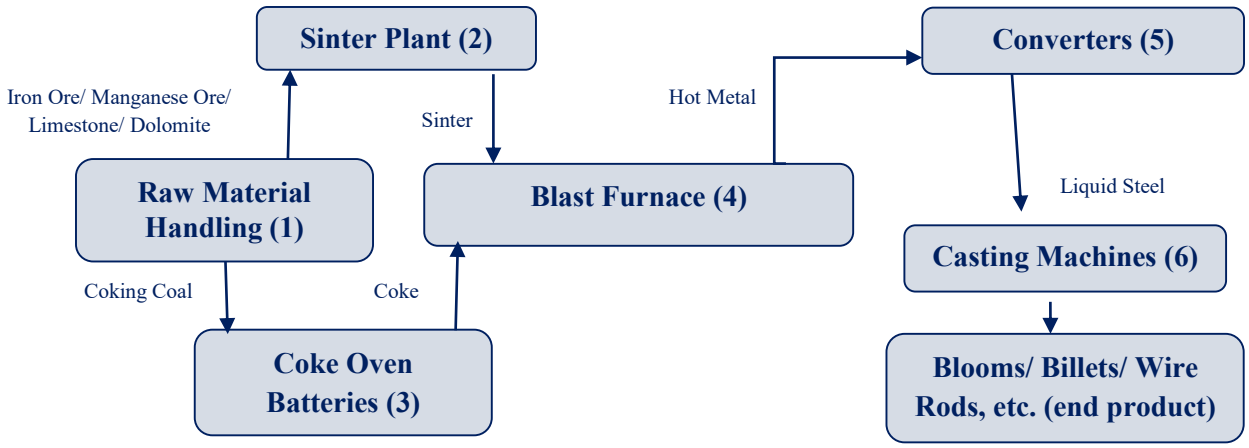
# CHAPTER II: Assessment of Environmental issues

## 2.1 Introduction

Rashtriya Ispat Nigam Limited (RINL/ Company), Visakhapatnam was incorporated (February 1982) under the administrative control of the Ministry of Steel. It commenced full-fledged operations by August 1992 with the establishment of an integrated steel plant with an installed capacity of 3 million tonnes per annum of liquid steel. Later, RINL obtained (October 2005) approval to expand capacity to 6.3 million tonnes per annum of liquid steel and completed the expansion by December 2017. To augment capacity further to 7.3 million tonnes per annum of liquid steel, modernisation and revamping of Blast Furnaces No. 1 and 2, Sinter Machine No. 1, Steel Melting Shops No. 1 and 2 were completed and revamp of Sinter Machine No. 2 is expected to be completed in 2021-22.

Iron and Steel Industry, with its inherent complexities, pollutes the environment. The following process flow diagram indicates the types of pollution generated at each stage of steel-making.

**Chart 2.1: Flow chart indicating the major plants in RINL**
**Pollution generated by each Plant is indicated below against respective serial numbers shown in chart**




***(1) Air pollutants such as fugitive dust emissions.***
***(2) Sinter dust in the air and effluents discharge in water.***
***(3) Air pollutants such as Nitrogen Di-oxide ($NO_2$), Sulphur Di-oxide ($SO_2$), Carbon Di-oxide, etc; Fugitive emissions[1] such as leakages from doors, charging lids; Effluent discharge such as oil and grease, phenolic compounds, cyanides, ammonia nitrates; and Hazardous wastes such as Benzol Acid Sludge, etc.***
***(4) Blast Furnace slag, Blast Furnace flue dust and Blast Furnace Gas pollutes air, Blast Furnace sludge pollutes water.***
***(5) Steel Melting Shop slag, dust pollutes air and effluents pollute water.***
***(6) Metallurgical waste water discharge pollutes water.***

[1] ***Fugitive emissions are gases and vapours accidentally released into the atmosphere.***

Besides these six units, RINL also has a captive Thermal Power Plant which produces power by consumption of coal. In the process, this Thermal Power Plant generates fly ash and dust which causes air pollution and slag and effluent discharge that pollutes water.

Hence, steel plants are considered as one of the 17 categories of highly polluting industries and classified as 'Red' category[2] industry. Globally the steel industry generates between 7-9 *per cent* of direct emissions from the use of fossil fuels and emits an average of 1.85 tonnes of carbon dioxide ($CO_2$) for every tonne of steel produced. These warrant high degree of care and responsibility in controlling emissions.

The details of capital investment on pollution controlling equipment at each stage of Capacity Expansion along with expenditure incurred on their maintenance for the last three years are as follows:

**Table 2.1: Capital Expenditure incurred on each stage of Expansion on Pollution Controlling Equipment**

| Stage of Capacity Expansion (in mtpa*) | Year of installation | Capital Investment on Pollution Controlling Equipment (₹ in crore) |
|---|---|---|
| 3.0 | July 1990 to August 1996 | 467.95 |
| 6.3 | April 2009 to December 2017 | 1,283.00 |
| 7.3 | October 2014 to till date | 558.99 |

* million tonnes per annum

**Table 2.2: Maintenance Expenditure on Pollution Controlling Equipment**

| Year | Maintenance Expenditure on Pollution Controlling Equipment (₹ in crore) |
|---|---|
| 2017-18 | 356.65 |
| 2018-19 | 407.65 |
| 2019-20 | 431.19 |

## 2.2 Environmental Legislative/ Organisational Framework

**a.** Considering the nature of manufacturing activities, control of air, water and noise pollution, management and handling of solid and hazardous wastes and continued efforts for green belt development are essential. The Ministry of Environment, Forest and Climate Change accords environmental clearance for new projects/ expansions and also frames Acts, Rules and issues notifications for preserving the environment as well as to meet the international commitments on environment. Central Pollution Control Board provides technical services to the Ministry of Environment, Forest and Climate Change through framing of Environmental Standards and Guidelines to promote environmental

[2] ***As per directions (March 2016) of Ministry of Environment, Forest and Climate Change, industries are categorised into 'Red' if Pollution Index is 60 and above, 'Orange' category if Pollution Index is between 41 to 59, 'Green' if Pollution Index is between 21 to 40 and 'White' if Pollution Index is up to 20. Pollution Index is calculated based on the composite score against Air Pollution, Water Pollution and Hazardous Wastes generated by the Industry.***

protection, control and abatement of water pollution, and to improve the quality of air by prevention, control or abatement of air pollution in the country. Andhra Pradesh Pollution Control Board, along with Central Pollution Control Board, is a statutory organisation entrusted to implement Environmental Laws and Rules within the state of Andhra Pradesh.

**b.** Andhra Pradesh Pollution Control Board issues Consent For Operations of the Plants under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 and under Section 25 and 26 of the Water (Prevention and Control of Pollution) Act, 1974 and grants authorizations under the Hazardous Waste (Management and Handling) Rules, 1989. Andhra Pradesh Pollution Control Board is an authority to monitor, control, regulate and issue notices to all the defaulting industries in Andhra Pradesh.

**c. Organisational Set-up**

RINL is governed by Board of Directors headed by the Chairman-cum-Managing Director who is assisted by five Functional Directors looking after Operations, Commercial, Projects, Finance and Personnel. General Managers are in-charge of Environmental Management Department and Energy Management Department and report to Executive Director (Works) who in turn reports to Director (Operations).

## 2.3 Audit Scope, Methodology and Criteria

The Audit on "Assessment of Environmental Issues in RINL, Visakhapatnam" was conducted for the period covering three years 2017-18 to 2019-20 to review the pollution control measures taken up by RINL. It also reviewed the role of Andhra Pradesh Pollution Control Board, in respect of RINL, in the enforcement of environment related safeguards and their effectiveness and adequacy.

Entry Conference was held with the Management of the Company on 21 August 2020 in which Audit objectives, scope and methodology of Audit were discussed. Audit methodology included examination of records of RINL, documents relating to issue of Environmental Clearances, Consent Letters, issue of Audit Memos, raising observations, interacting with the officers of RINL and finalisation of Draft Audit Report. The Draft Report was discussed with the Management during an Exit Conference held on 8 April 2021.

Audit criteria for assessing the effectiveness of pollution control measures undertaken by RINL were:

- Environmental Management System and Environmental Impact Assessment Study;
- Parameters/ norms on management of air quality, water quality, noise reduction and waste management prescribed by the Ministry of Environment, Forest and Climate Change, Central Pollution Control Board and Andhra Pradesh Pollution Control Board

through various Acts/ Notifications/ Rules for steel industry in general, and for RINL in particular.

## 2.4 Audit Objectives

Audit was conducted to assess whether:

(i) RINL had an appropriate and effective Environmental Management Plan and system in place to discharge environment related responsibilities;

(ii) RINL has complied with the Acts/ Rules/ Notifications framed by the Government of India/ State Government; and

(iii) Andhra Pradesh Pollution Control Board discharged its role efficiently in enforcing environment related safeguards and monitoring of activities of the Company.

## 2.5 Audit Findings

### 2.5.1 Environmental Management System - Commencement of operations without Environmental Clearance

Environmental Management System refers to the management of an organization's environmental programmes in a comprehensive, systemic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environment protection.

RINL is devising Environmental Management System at its different units for environment protection, and also making efforts to acquire voluntary accreditations such as ISO 14001 which signifies Plant's efforts for good Environmental Management System. RINL has received ISO 14001 for Iron and Steel Production Unit, Coke Making Plant, Utility Gases and Captive Power Generation Units.

RINL proposed (January and May 2008) to enhance the capacities of Blast Furnaces No.1 and 2 from 2 to 2.5 million tonnes per annum each during their Category I capital repairs, which would enhance the production capacity of RINL to 7.3 million tonnes per annum of liquid steel. As per the Ministry of Environment, Forest and Climate Change Notification (14 September 2006), all projects or activities included in Category-A in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, shall require prior environmental clearance from Central Government which will be based on the recommendations of an Expert Appraisal Committee to be constituted by the Central Government.

However, RINL commenced (October 2013) the enhancement of capacity of Blast Furnace No. 1 through capital repairs without obtaining approval from Central Government. Application to the Ministry of Environment, Forest and Climate Change was submitted belatedly on 30 June 2016 for undertaking detailed Environmental Impact Assessment study for the Project. Subsequently, based on recommendations of Expert Appraisal Committee after its initial evaluation in July 2016, RINL conducted (15 June

2017) public hearing and submitted (9 January 2018) an online application along with the copies of Environmental Impact Assessment/ Environmental Management Plan seeking Environmental Clearance for the expansion from 6.3 to 7.3 million tonnes per annum under the provisions of the Environmental Impact Assessment Notification, 2006.

The Expert Appraisal Committee, thereafter, observed (February 2018) that RINL has already started the proposed modernization and revamping activities in 2013. It was also observed that the fact of violation of Environmental Impact Assessment Notification, 2006 was not disclosed in the proposal for Environmental Clearance application and related documents submitted in January 2018. Instead, the brief Report by Environmental Impact Assessment Consultant stated (3 February 2018) that "as mentioned by RINL, there is no court case or violation under Environmental Impact Assessment Notification for the project or related activity". Committee considered it as concealing of factual information. Therefore, the Expert Appraisal Committee recommended to initiate appropriate action against the Consultant for concealing the fact and misguiding the Expert Appraisal Committee and the Ministry.

The Ministry of Environment, Forest and Climate Change issued (March 2018) a show cause notice to RINL seeking explanation as to why the earlier Environmental Clearance for 6.3 million tonnes per annum should not be revoked. RINL requested (21 March 2018) for condonation of the delay in complying with the procedural aspects to obtain environmental clearance prior to implementation of Expansion Project keeping in view the compelling conditions under which the technologically necessitated repair/ upgradation works were carried out with a primary objective of complying with latest environmental norms.

RINL submitted (29 March 2018) a fresh proposal to the Ministry of Environment, Forest and Climate Change which was presented in the Expert Appraisal Committee meeting held in June 2018. Expert Appraisal Committee confirmed it to be a case of violation of the Environmental Impact Assessment Notification, 2006 and recommended for issuing the Terms of Reference for undertaking Environmental Impact Assessment and preparation of Environmental Management Plan. It was further recommended to the State Government/ Andhra Pradesh Pollution Control Board to take action against the project proponent (RINL) and not to issue Consent for Operations for the Expansion Project till the project is granted Environmental Clearance. It further directed RINL to submit a bank guarantee as per the quantum to be recommended by the Expert Appraisal Committee and finalized by the Regulatory Authority. Fund allocation for Corporate Environmental Responsibility was to be made as per OM of the Ministry of Environment, Forest and Climate Change dated 1 May 2018 for various activities therein. The details of fund allocation and activities for Corporate Environmental Responsibility were to be incorporated in Environmental Impact Assessment/ Environmental Management Plan Report.

In compliance, RINL submitted (28 August 2018) a revised proposal for Environmental Clearance for the Expansion Project. Expert Appraisal Committee recommended (February 2019) the proposal for grant of Environmental Clearance subject to specific conditions in addition to all standard conditions applicable for such projects. The specific conditions included spending of ₹14 crore in a span of three years towards Remediation Plan, Natural Resource Augmentation Plan and Community Resource Augmentation Plan. Further, an amount of ₹17 crore was to be allotted towards Corporate Environmental Responsibility. Finally, the Ministry of Environment, Forest and Climate Change granted (June 2019) Environmental Clearance for the Capacity Expansion from 6.3 to 7.3 million tonnes per annum.

Meanwhile, the Ministry of Steel directed (5 July 2018 and 15 February 2019) RINL to enquire into the lapses in obtaining the Environmental Clearance for 7.3 million tonnes per annum Capacity Expansion Project and identify the departments and the officers responsible for the lapses and take appropriate disciplinary action. RINL constituted (13 March 2019) a Committee to look into the matter and the Committee, in its Report, concluded (18 March 2019) that the lapses occurred mainly due to the collective miscomprehension of statutory requirements and were unintended.

Thus, failure to obtain Environmental Clearance for the capacity expansion to 7.3 million tonnes per annum prior to its implementation led to violation of the guidelines of the Ministry of Environment, Forest and Climate Change.

Management stated (April 2021) that the delay in obtaining the Environmental Clearance was based on the understanding that an amendment to the Environmental Clearance for 6.3 million tonnes per annum would be sufficient for taking up the revamping works also. The Ministry of Steel stated (July 2021) that the modernization of various activities was taken up without prior Environmental Clearance under the presumption that production was not likely to reach even 6.3 million tonnes per annum in the immediate future as the various units would be shut down for modernization one after another, the pollution loads were anticipated to decrease post modernization and there was no change in the product mix. However, the Ministry of Steel admitted that the lapse in obtaining prior Environmental Clearance was mainly due to collective miscomprehension of the statutory requirement and was unintentional.

Response needs to be seen in light of the fact that RINL had formed a Committee in March 2019 to identify the department and officers responsible for this lapse, however, the Committee concluded that this was due to collective miscomprehension of the statutory requirement as has been responded to by the Ministry. The Committee also mentioned in its Report that heads of Utility Section of Design and Engineering Department who were involved in the process had already separated from the Company. However, the fact remains that Expansion Project to increase capacity to 7.3 million tonnes per annum was taken up without obtaining Environmental Clearance and no action has been taken on this by the Company.

### 2.5.2 Air Pollution

As per the requirements stipulated in the Environmental Clearance issued to RINL, RINL shall install Continuous Ambient Air Quality Monitoring Stations for monitoring main pollutants released (e.g., $PM_{10}$ and $PM_{2.5}$ with reference to Particulate Matter emission, Carbon Monoxide (CO), Sulphur Di-oxide ($SO_2$) and Nitrogen Di-oxides ($NO_2$) with reference to CO, $SO_2$ and $NO_2$ emissions) within and outside the Plant Area at least at four locations (one within and three outside). RINL installed Continuous Ambient Air Quality Monitoring Stations at seven locations (three[3] Continuous Ambient Air Quality Monitoring Stations within the Plant area and four[4] Continuous Ambient Air Quality Monitoring Stations outside the Plant area) against the requirement of four Continuous Ambient Air Quality Monitoring Stations to monitor the Ambient Air Quality.

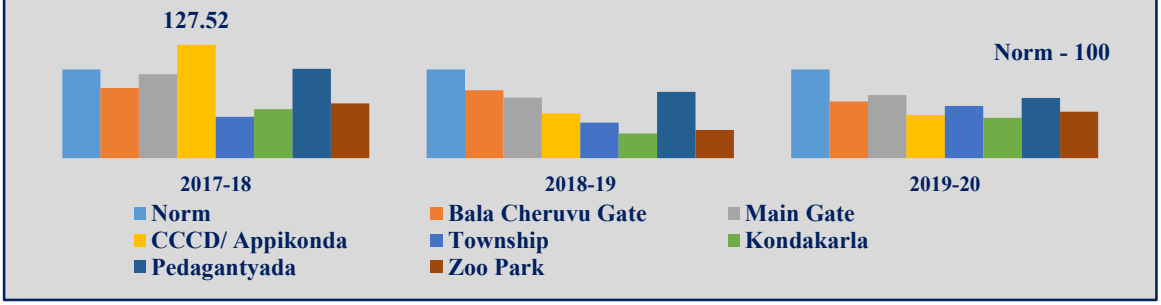
Audit observations in this regard are given below:

#### 2.5.2.1 Levels of suspended Particulate Matter

Audit noticed that $PM_{2.5}$ was monitored at only three locations, all within the plant area and was not monitored in any of the locations outside the Plant area. The Station installed at Coke and Coal Chemicals Department, Appikonda consistently monitored only $PM_{10}$.

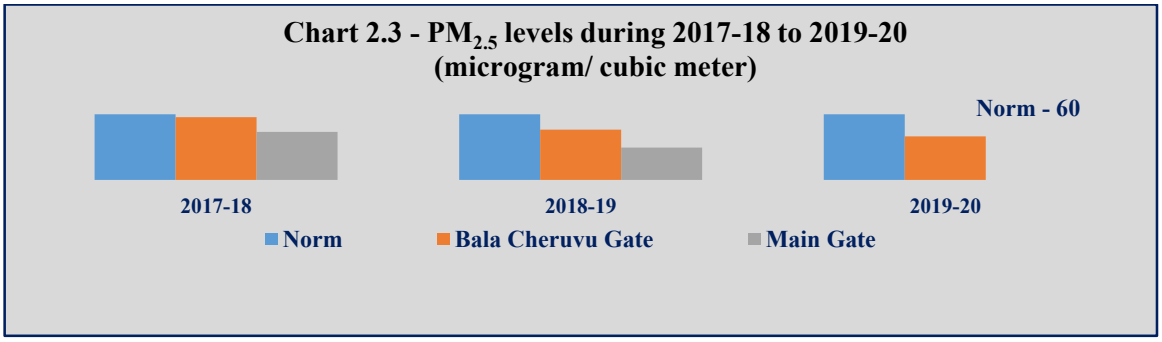
a) $PM_{10}$ exceeded the norms only during 2017-18.

**Chart 2.2 - $PM_{10}$ levels during 2017-18 to 2019-20 (microgram/ cubic meter)**

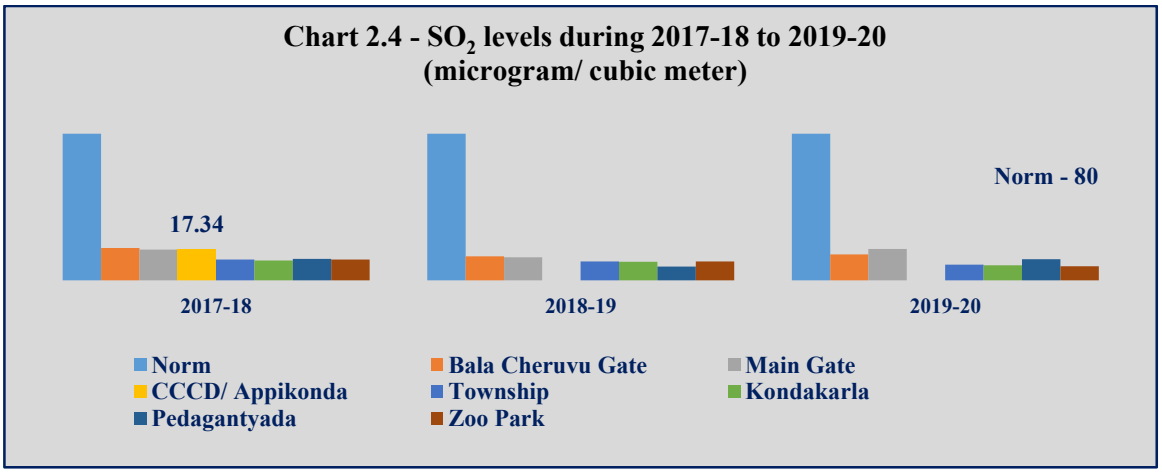



b) $PM_{2.5}$ was monitored in all the months at Bala Cheruvu Gate and only during 2017-18 and 2018-19 at Main Gate. It was, however, monitored only for a few months during the entire three years ended 31 March 2020 at Coke and Coal Chemicals Department, Appikonda.

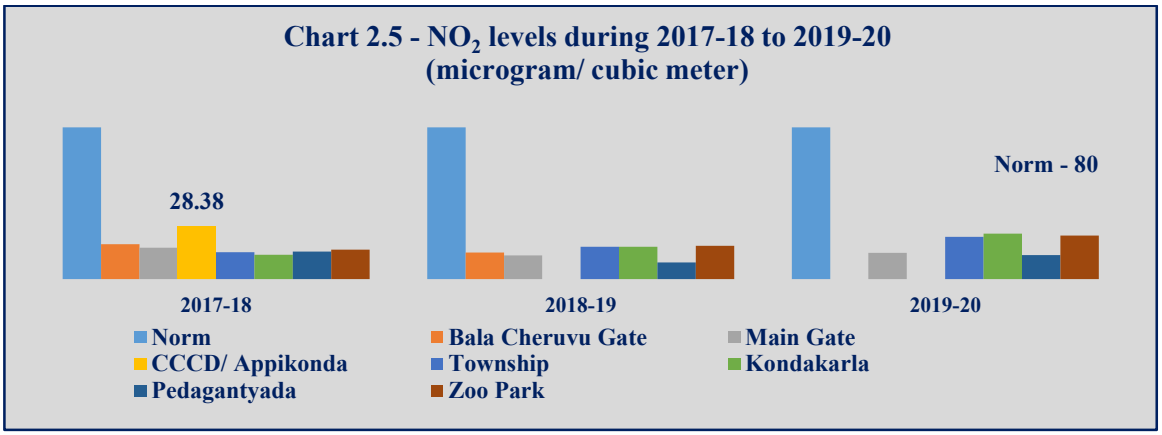
[3] ***Bala Cheruvu Gate, Main Gate and Coke and Coal Chemicals Department, Appikonda.***
[4] ***Township, Kondakarla, Pedagantyada and Zoo Park.***




c) $SO_2$ was within the norms at all the monitored stations. It was, however, not monitored at Coke and Coal Chemicals Department, Appikonda during 2018-19 and 2019-20.




d) $NO_2$ was within the norm at all the monitored stations. $NO_2$ was not monitored at Coke and Coal Chemicals Department, Appikonda during 2018-19 and 2019-20 and at Bala Cheruvu Gate during 2019-20.




### 2.5.2.2 Higher levels of Carbon Monoxide

Carbon Monoxide (CO) is a toxic gas that is invisible and odourless. CO is generated from incomplete combustion of fuel or other carbon-based materials. Breathing CO may cause headache, dizziness, vomiting and nausea. Higher levels of CO may cause unconsciousness or death.

The Ministry of Environment, Forest and Climate Change issued a Notification on 16 November 2009 stipulating that CO levels should be less than 2,000 micrograms per cubic meter.

**a) CO Levels at Plant Areas**

The CO levels at all locations in the Plant Area were within the norm during the period of three years except at Main Gate, for the year 2018-19 where it exceeded the norm of 2,000 micrograms per cubic meter during May to September 2018 and ranged between 2,334.50 (May 2018) and 3829.50 micrograms (June 2018) per cubic meter. As CO is a toxic gas and causes health problems, necessary steps such as reduction of fugitive charging emissions[5] in Coke Oven Batteries, implementation of High Pressure Liquor Aspiration[6] technology in Coke Oven Batteries 1 to 3, etc. may be taken to keep CO levels within the stipulated norms.

Management stated (April 2021) that it has taken steps in respect of Coke Oven Batteries such as identifying and rectifying the door leaks, providing high pressure nozzles to control charging emissions etc., to keep Ambient Air Quality levels of CO emissions within the norms stipulated by the Ministry of Environment, Forest and Climate Change. The Ministry of Steel added (July 2021) that the steps taken are continuous in nature to control the emissions and the same are being expedited religiously.

Despite the steps taken by the Management, during the years 2018-19 and 2019-20, the Percent Leaking Doors[7] from Coke Oven Battery 4 exceeded the standard of 10 *per cent* in 18 of 24 months and ranged between 10.26 and 13.13. Percent Leaking Lids[8] exceeded the standard of one *per cent* in three of the four Coke Oven Batteries (Batteries no. 1, 2 and 3). Further, as against the emission standard for the charging emissions of 75 seconds for the Coke Oven Batteries No. 1, 2 and 3 and 50 seconds for Coke Oven Battery No. 4 with High Pressure Liquor Aspiration, the charging emissions were in excess in respect of all the four Coke Oven Batteries in all the months and it ranged between 112 and 137.

**b) CO Levels at Coke Ovens**

RINL has installed 230 CO monitors to monitor CO emissions inside the Plant. As per the Ministry of Environment, Forest and Climate Change Notification dated 31 March 2012 and the Consent for Operations dated 27 April 2015 issued by Andhra Pradesh Pollution Control Board, CO emissions should not exceed 3 kilograms per tonne of coke produced

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[5] ***Charging Emissions are the emission of coal dust and other emission, during charging of a Coke Oven. If there is an emission for 20 seconds during a charging time of 40 seconds, charging emissions would be 20 seconds per charge.***

[6] ***Aspiration through high pressure liquor injection in gooseneck to control fugitive emissions effectively.***

[7] ***Percent Leaking Doors is the percentage of number of doors which are emitting minor emissions to the total number of doors. Doors are on each side of an oven and there are many ovens in a Coke Oven Battery. If 12 doors out of 60 doors in an entire Coke Oven Battery are found leaking, Percent Leaking Doors will be 20 (12/60*100).***

[8] ***Percent Leaking Lids is the percentage of number of lids which are emitting minor emissions to the total number of lids. Lids are the top sealing of an oven.***

and RINL was to submit a Monthly Compliance Report on CO emissions to Andhra Pradesh Pollution Control Board. However, RINL started submitting these Reports from February 2020 only. Though CO emissions from Coke Oven Batteries No. 1 and 2 for the months of February and March 2020 were within the Board's standard of 3 kilograms per tonne of coke produced, the emissions per tonne of coke produced from Coke Oven Batteries No. 3 and 4 for the months of February 2020 and March 2020 were 7.65 and 6.27 kilograms and 7.66 and 5.25 kilograms respectively.

The Ministry of Steel in July 2021 and Management in April 2021 stated that the Regime Adjustment[9] was being done to bring the CO content below the norm in case of Coke Oven Batteries No. 3 and 4.

However, the adjustment of Coke Oven Batteries heating regime was yet to be done (July 2021).

### 2.5.2.3 Excess emissions from Coke Oven Batteries

Coke Oven Batteries are a major source of fugitive air emissions from charging holes and leakages from doors and lids. The coking process in Coke Oven Batteries emit Particulate Matter and Volatile Organic Compounds such as Benzene, Polycyclic Aromatic Hydrocarbons, etc., which contain several carcinogens[10].

RINL has four Coke Oven Batteries to produce coke required for the production of hot metal in its three Blast Furnaces. Of the four Coke Oven Batteries, one Coke Oven Battery (viz., No. 4) is having High Pressure Liquor Aspiration technology to reduce fugitive emissions during charging.

As per the Ministry of Environment, Forest and Climate Change Notification dated 31 March 2012, emission standards for Percent Leaking Doors, Percent Leaking Lids and Percent Leaking Offtake[11] (Ascension Pipe Covers) for the existing Coke Oven Batteries (No. 1, 2, 3 and 4) should be 10 *per cent*, one *per cent* and four *per cent* respectively.

In this regard, Audit observed that:

a) Percent Leaking Doors in respect of Coke Oven Batteries No. 1, 2 and 3 were within the norm of 10 *per cent* but the same in respect of Coke Oven Battery No. 4 exceeded the standard of 10 *per cent* in all the three years ending 2019-20 and was 11.54, 10.794 and 11.283 during 2017-18, 2018-19 and 2019-20 respectively.

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[9] ***Regime adjustment includes achieving uniform temperature distribution in the heating system throughout the entire length of Coke Oven Battery and maintenance of gas pressure in the sole of the coking chamber and suction in different parts of the heating system as per the production procedure.***

[10] ***A carcinogen is an agent with the capacity to cause cancer in humans.***

[11] ***Ascension Pipe is the pipe which off-takes coke oven gas and is on the top. Percent Leaking Offtake is the percentage of number of Ascension Pipes which are emitting minor emissions to their total number in the entire Coke Oven Battery.***

b) Percent Leaking Lids exceeded the standard of one *per cent* in three out of the four Coke Oven Batteries i.e., No. 1, 2 and 3 in all the three years ending 2019-20 and ranged between 1 and 3.4 *per cent*.

c) Percent Leaking Offtake for the period of three years ending 2019-20 in all the four Coke Oven Batteries was within the standard of four *per cent* stipulated by the Ministry of Environment, Forest and Climate Change.

Further, the above notification also stipulated that the charging emissions should not exceed 75 seconds per charge for the Coke Oven Batteries No. 1, 2 and 3 and 50 seconds per charge for the Coke Oven Battery with High Pressure Liquor Aspiration technology (viz., Coke Oven Battery No. 4).

In this regard, Audit noticed that the charging emissions in respect of all the four Coke Oven Batteries in all the three years ending 2019-20 were in excess of the standards stipulated by the Ministry of Environment, Forest and Climate Change as follows:

- As against the emission standard of 75 seconds per charge for the Coke Oven Batteries (No. 1, 2 and 3), the charging emissions for the above period ranged between 123 and 131 seconds.

- As against the emission standard of 50 seconds per charge for Coke Oven Battery No. 4 which had High Pressure Liquor Aspiration technology, the charging emissions for the above period were similar to Coke Oven Batteries No. 1, 2 and 3 which were without High Pressure Liquor Aspiration technology and the same ranged between 125 and 131 seconds.

Management stated (April 2021) that changing of defective door frames for Coke Oven Battery No. 4 was taken up and would be completed at the earliest to keep the Percent Leaking Doors within the norm. As regards Percent Leaking Lids, it was stated that deviations were due to the hatch ring ovality and the replacement of hatch ring was planned and it would be rectified at the earliest. Regarding charging emissions, it was stated that necessary actions for the technological upgradations such as High Pressure Liquor Aspiration and Screw Feeders are required to be taken up. The Ministry of Steel stated that (July 2021) the actions initiated were being continued to keep the Percent Leaking Lids, Percent Leaking Doors and charging emissions within the norms.

The replies of the Ministry of Steel and Management confirm the Audit observation and indicate that steps are being taken to keep the fugitive and charging emissions within the norms.

***Recommendation No. 1: Steps may be taken for regular monitoring of parameters like Percent Leaking Lids, Percent Leaking Doors and Percent Leaking Offtake etc., in Coke Oven Batteries to keep these under control and ensure compliance to the fugitive and charging emission norms as stipulated by Ministry of Environment, Forests and***

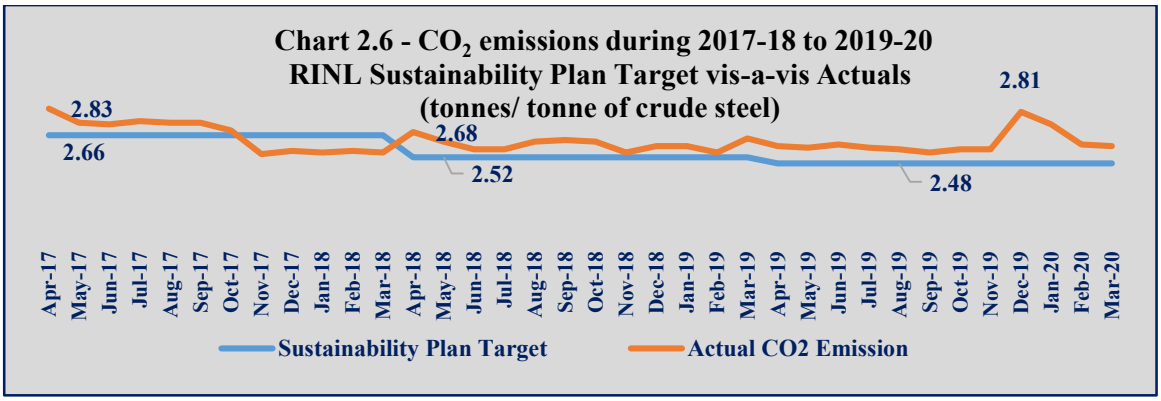
***Climate Change. Necessary repairs/upgradation in technology required to be done in Coke Oven Batteries may also be carried out at the earliest.***

### 2.5.2.4 Excess emission of Carbon Di-oxide ($CO_2$)

Carbon Di-oxide ($CO_2$) is the primary Green House Gas and contributes to about three-quarters of the total Green House Gas emissions. $CO_2$ emissions mainly come from burning of organic materials such as coal, oil, gas, etc. They cause climate change by trapping heat (global warming) and they also contribute to respiratory related diseases from smog and air pollution. Extreme weather, food supply disruptions and increased wild fires are the other effects of climate change caused by green house gases.

India is one of the 20 largest emitters of green house gases including USA and China. Countries around the world including India are committed to reduce green house gas emissions as per Paris Agreement (December 2015) for Climate Change. Integrated Steel Plants are one of the largest emitters of green house gases. They may not be totally able to avoid green house gas emissions but they can minimise the emissions by implementing cleaner technologies.

To reduce $CO_2$ emissions from its operations, RINL fixed Sustainability Plan Targets from time to time for the $CO_2$ emissions. On a review of the targets vis-à-vis the actual $CO_2$ emissions for the period of three years ending 2019-20, it was observed that RINL mostly failed to keep the $CO_2$ emissions within the Sustainability Plan Targets as indicated in Chart given below:




The reasons for the $CO_2$ emissions in excess of targets for the years 2018-19 and 2019-20 included high fuel consumption rate, increased consumption of power in Blast Furnaces and Steel Melting Shops and excess consumption of auxiliary power in Thermal Power Plant. Thus, failure to keep the $CO_2$ emissions within the Sustainability Plan Targets for the years 2018-19 and 2019-20 resulted in excess emissions of 10.33 lakh tonnes of $CO_2$. Necessary steps such as optimum usage of coke, power and coal along with plantation of trees to absorb $CO_2$, etc., may be taken to keep the emissions within the Sustainability Plan Targets thereby contributing to reduction in global warming.

Management, while indicating the energy conservation technologies/ waste energy recovery systems being implemented in various facilities of the Company, stated (April

2021) that these actions are expected to reduce $CO_2$ emissions from 2.62 (2019-20) to 2.40 tonnes per tonne of crude steel. The Ministry of Steel, while agreeing (July 2021) to reduce $CO_2$ emissions stated that it is expected that RINL can reduce $CO_2$ emissions to 2.4 tonnes per tonne of crude steel at rated capacity of 7.3 million tonnes of hot metal and operation of all facilities at full capacity.

Audit noticed that, despite the above mentioned measures, the $CO_2$ emissions for the year 2020-21 ranged between 2.50 (February 2021) and 2.87 tonnes per tonne of crude steel (August 2020) as against the target of 2.40 tonnes per tonne of crude steel and the average $CO_2$ emission for the year 2020-21 was 2.69 tonnes per tonne of crude steel. Further, since RINL is yet to operate all facilities at their full rated capacities (June 2021) achievement of desired reduction of $CO_2$ to 2.4 tonnes per tonne of crude steel is remote.

***Recommendation No. 2: RINL may put efforts to operate all facilities at their rated capacities to keep the $CO_2$ emissions within the Sustainability Plan Targets.***

#### 2.5.2.5 Stack Emissions

Stack emissions are the emissions released at height from the stacks attached to various production units and dispensed in the atmosphere. Stack emissions are managed using a variety of controls such as Raw Material Beneficiation (i.e., removing potential contaminants before further processing), Yield/ Process Optimisation ('more with less'), Combustion Control and Abatement Technologies (i.e., Bag Filters, Electro Static Precipitators, Wet Scrubbing Systems, Activated Carbon Absorbers, Cyclone Separators, Mist Eliminators, etc.), Source Monitoring, Incident Investigation, Plant Inspections, Source Modelling and Targeted Plant Maintenance Regimes. RINL has installed 39 equipment at various locations of Plant to monitor Stack emissions.


**Figure 2.1: CRMP chimney**

The shortcomings noticed in the maintenance of pollution control equipment and the emissions are discussed in the succeeding paragraphs.

**a) Unreliable data due to non-upgradation of obsolete Online Continuous Emission Monitoring System**

RINL has installed 39 Online Continuous Emission Monitoring Systems for continuous monitoring of the stack emissions. Andhra Pradesh Pollution Control Board conducted an inspection in January 2020 and issued (7 February 2020) show cause notice to RINL on inadequacy or malfunctioning of the Pollution Control Equipment. In reply to the above show cause notice, RINL, while furnishing the explanation to Andhra Pradesh Pollution Control Board, stated (12 February 2020) that Online Continuous Emission Monitoring Systems, which were installed in 2005-07, working on Tribo-Electric Methodology have become obsolete affecting the reliability and accuracy of the said equipment. RINL also

stated that 29 Online Continuous Emission Monitoring Systems would be upgraded. Accordingly, RINL awarded (20 May 2020) two contracts to M/s Environment SA India Private Limited at a total cost of ₹7.31 crore for the upgradation of Online Continuous Emission Monitoring Systems with scheduled completion in March 2021. However, these Systems were yet to be upgraded (June 2021).

It was observed that data generated from these Online Continuous Emission Monitoring Systems during the Audit period was not reliable. It was observed that Online Continuous Emission Monitoring Systems attached to the Stacks have reported exceedances and reported wide variations before and after calibrations. For instance, after the calibration of Suspended Particulate Matter Analyser done on 27 January 2020 attached to Thermal Power Plant Boiler No. 2, the Analyser has shown increase in Suspended Particulate Matter scale by 32 *per cent*.

Management stated (April 2021) that complete replacement of 29 Online Continuous Emission Monitoring Systems to meet the latest Central Pollution Control Board guidelines of 2018 with remote calibration facilities was initiated and the same is under progress and would be completed soon. Ministry added (July 2021) that commissioning activities are in the final stage and are expected to be completed by July 2021.

As of August 2021, only 15 Online Continuous Emission Monitoring Systems could be commissioned and made operational.

***Recommendation No. 3: RINL may expedite the installation and functioning of Online Continuous Emission Monitoring Systems and carry out expert audit to check its proper functioning.***

**b) Excess $PM_{10}$ from Stacks**

As per Renewal of Consent and Authorisation Orders issued by Andhra Pradesh Pollution Control Board from time to time valid up to 30 April 2023, the $PM_{10}$ emission from the stack should not exceed 50 milligrams per cubic meter. However, it was observed that the $PM_{10}$ emissions were in excess of the Andhra Pradesh Pollution Control Board norm of 50 milligrams per cubic meter in ten stacks out of the 39 stacks during the three-year period ending 2019-20 as shown below:


**Figure 2.2: TPP Chimney**

**Table 2.3: $PM_{10}$ emission from 10 stacks in excess of norms**

*(milligrams per cubic meter)*

| Stack | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|
| Air Cleaning Plant of Sinter Plant | 92.6 | 68.8 | 103.4 |
| Boiler – I of Thermal Power Plant | 128.2 | 101.1 | 79.28 |
| Boiler – II of Thermal Power Plant | 99.5 | 101.1 | 79.28 |
| Boiler – III of Thermal Power Plant | 140.6 | 81.3 | 95.41 |

| | | | |
|---|---|---|---|
| Boiler – IV of Thermal Power Plant | 116.5 | 81.3 | 95.41 |
| Boiler – V of Thermal Power Plant | 95.0 | 64.8 | 97.14 |
| Boiler – VI of Thermal Power Plant | 60.9 | 75.4 | 63.19 |
| Calcining and Refractory Materials Plant – Flux Kiln - I & II | 112.3 | 83.3 | 86.50 |
| Calcining and Refractory Materials Plant – Flux Kiln - III & IV | 86.3 | 87.1 | 73.55 |
| Calcining and Refractory Materials Plant – Flux Kiln – V | 42.4 | 63.3 | 60.41 |

The Ministry of Steel (July 2021) and Management (April 2021) stated that revamping works were already initiated to control stack emissions from Electro Static Precipitators[12] No. II to V of Thermal Power Plant by April 2023. Replacement of bag filters of Calcining and Refractory Materials Plant Flux Kilns No. I to V and Electro Static Precipitators of Air Cleaning Plant No. 2 and Gas Cleaning Plant No. 2 of Sinter Plant would be completed by July 2021.

RINL has initiated corrective actions which would aid in reducing emissions in stages and are expected to be fully complete by April 2023.

### 2.5.2.6 Non-disposal of Halon Gas Cylinders

Halon Gas is a liquefied, compressed gas that stops the spread of fire by chemically disrupting combustion. Since Halon Gas depletes the ozone layer as determined in Montreal Protocol in 1989, the use of Halon Gas was banned in 1994.

RINL commissioned Halon Gas based Fire Fighting and Protection System in the production units of the plant during 1990-91. Ministry of Defence had informed (October 2011) the Central Industrial Security Force (CISF) unit deployed in RINL that Halon Gas based Fire Fighting and Protection System should have been phased out before the deadline of 1 January 2010. This was required to be done under Montreal Protocol[13] adopted by India. Ministry of Defence directed CISF unit in RINL to surrender and submit all phased out surplus Halon Gas filled cylinders from the industrial units to the India National Halon Bank at the Centre for Fire, Explosive and Environment Safety Laboratory of the Defence Research and Development Organisation for their safe disposal. However, Audit observed that though RINL phased out the Halon Gas Fire Fighting System in phases by replacing with Inergen Gas, 42 nos. of phased out Halon Gas based Fire Fighting cylinders were still lying with RINL as of 31 March 2021.

Management stated (April 2021) that RINL was in continuous communication with Centre for Fire, Explosive and Environment Safety Laboratory for safe disposal of Halon Gas

[12] ***An Electro Static Precipitator is a filter-less device that removes fine particles, like dust and smoke, from a flowing gas using a force of an induced electrostatic charge minimally impeding the flow of gases through the unit.***

[13] ***The Montreal Protocol on substances that deplete the ozone layer is a multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as ozone depleting substances. The Protocol was adopted on 15 September 1987 by the United Nations Treaty. Montreal Protocol phases down the consumption and production of the different Ozone Depleting Substances in a step-wise manner, with different timetables for developed and developing countries.***

cylinders and the Laboratory has informed that they would intimate as soon as there is availability of space at their storage area. Ministry added (July 2021) that RINL is pursuing the matter and is awaiting communication from Centre for Fire, Explosive and Environment Safety Laboratory for safe disposal of Halon Gas cylinders.

The fact remains that RINL is yet to dispose the Halon Gas cylinders (July 2021).

***Recommendation No. 4: RINL may ensure the disposal of Halon Gas Cylinders at the earliest.***

### 2.5.2.7 Rebuilding of Coke Oven Batteries as part of Charter on Corporate Responsibility for Environment Protection, 2003

To regulate the most polluting industries (including Integrated Iron and Steel Industry) in India, a Charter called Charter on Corporate Responsibility for Environmental Protection was agreed between industries and regulators in 2003.

Coke Ovens play a vital role in steel making. Coke is a product obtained from heating of coking coal in the absence of air, at around $1000^0$C, by which time coal loses all its volatile matter and also the solid residue gets re-crystallised into solid mass called Coke. The process of conversion of Coal to Coke in Coke Ovens is called 'Carbonisation'. During the process of Carbonisation, Coke Oven Batteries emit fugitive emissions which are carcinogenic and affect the health of the workers in those areas.

RINL has four Coke Oven Batteries and the fifth one was commissioned in December 2020. Four older Coke Oven Batteries viz., Coke Oven Batteries No. 1 to 4 were commissioned during the years 1989, 1991, 1992 and 2012 respectively. Hence, Coke Oven Batteries No. 1, 2 and 3 had completed 31 years, 29 years and 28 years of life respectively till the year 2020. The health of the Coke Oven Batteries deteriorates with the progress of its age and causes more emissions leading to air pollution. Keeping the above facts in view, the Ministry of Environment, Forests and Climate Change through Charter on Corporate Responsibility for Environmental Protection, 2003 stipulated that 40 *per cent* of the Coke Oven Batteries in Integrated Iron and Steel Industries should be rebuilt by December 2012. Though three of its Coke Oven Batteries have completed more than 28 years of life, RINL has not undertaken rebuilding of its three Coke Oven Batteries so far (July 2021), as required under Charter on Corporate Responsibility for Environmental Protection 2003.

Due to legal requirements, Coke Oven Plant operators were obliged to improve techniques for emission control, to revamp Coke Oven Batteries or in some cases to shut down Coke Oven Battery and build a new one if a new standard could not be fulfilled under the prevailing economic and technical conditions. Since RINL was not able to arrest charging emissions and fugitive emissions from leaking lids and offtake, as already pointed out in the Para No. 2.5.2.3 *supra*, Management may take immediate action to rebuild its older batteries with available advanced technologies to effectively control fugitive and charging emissions.

Management stated (April 2021) that efforts were being made to provide older Batteries with advanced technology at the time of their revamping and accordingly, Coke Oven Battery No. 1 was planned to be provided with advanced technology to enhance the emission control. The Ministry of Steel added (July 2021) that Coke Oven Battery No. 1 could not be put down for rebuilding due to non-materialisation of Coke Oven Battery No. 6 on Build Own Operate basis and in order to sustain the enhanced coke requirements, operating Coke Oven Battery No. 1 was necessitated. All efforts were being made on regular basis to contain the emissions from Batteries.

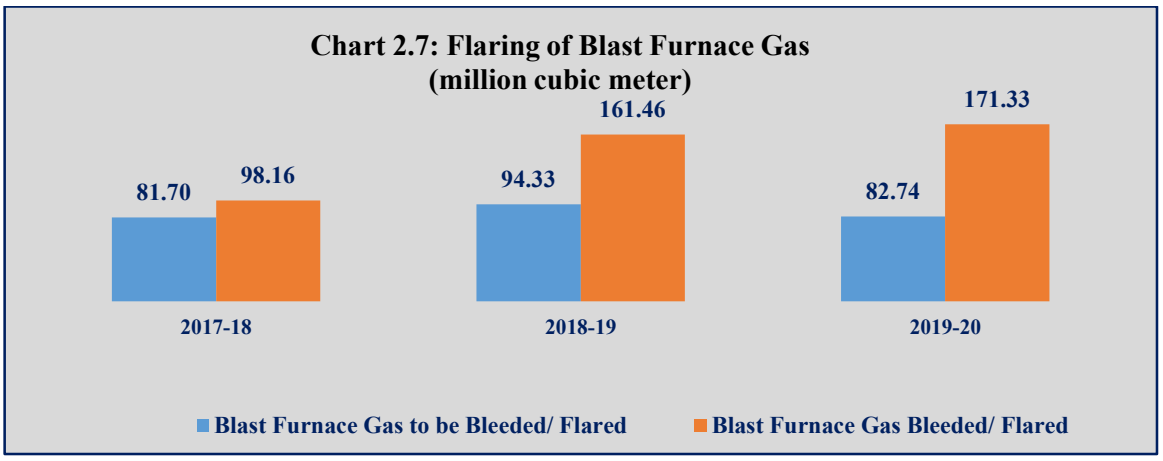
As pointed out in Para 2.5.2.3, all efforts made on regular basis to contain the emissions from Batteries have not controlled the fugitive emissions from all the four Coke Oven Batteries and even the average of fugitive emissions from Coke Oven Batteries No. 1 to 4 during the months of April, May and June 2021 were in excess of the norms stipulated by the Ministry of Environment, Forest and Climate Change.

***Recommendation No. 5: RINL may undertake rebuilding of the Coke Oven Batteries No. 1 to 3 in a phased manner to ensure that fugitive and charging emissions from them are controlled.***

### 2.5.2.8 Flaring up of Blast Furnace gas

Blast Furnace gas is generated from RINL's three Blast Furnaces while producing the hot metal. During generation of by-product gases and simultaneous distribution to various Plant units, a portion of Blast Furnace gas is being allowed for venting/ bleeding/ flaring due to non-creation of storage facility, in spite of continuous generation of gases. During the period of three years ending 2019-20, RINL flared up 430.95 million cubic meter of Blast Furnace gas out of 25,877.23 million cubic meter of Blast Furnace gas generated.

As per the Environmental Clearance granted by the Ministry of Environment, Forest and Climate Change for the Capacity Expansion to 7.3 million tonnes per annum, gas flaring should be restricted to 1 *per cent* of the total generation of gases. However, it was observed that Blast Furnace gas flared up during the period of three years ending 2019-20 was in excess of the 1 *per cent* stipulated by the Ministry of Environment, Forest and Climate Change. A total of 172.18 million cubic meter of Blast Furnace gas was flared, in excess of the norms prescribed, into the atmosphere for the period of three years ending 2019-20 as shown below:




The Ministry of Steel (July 2021) and Management (April 2021) stated that excess flaring of Blast Furnace gas for the year 2019-20 was due to reduction of its consumption at Captive Power Plant No. 1 as the boilers were under shutdown for capital repairs for substantial period. It was stated that the Blast Furnace gas offtake to Captive Power Plant No. 1 was expected to increase further after capital repairs and reduce flare of Blast Furnace gas to minimum.

Abatement of Air Pollution requires emission of certain gases/substances to be kept within the prescribed norms. Audit noticed higher levels/emissions of Carbon Monoxide (CO), Carbon Di Oxide ($CO_2$), $PM_{10}$ when compared with the Sustainability Plan targets and norms stipulated by regulatory bodies. There were excess fugitive emissions from Coke Oven Batteries also. RINL had not rebuilt its older Coke Oven Batteries as required under Charter on Corporate Responsibility for Environment Protection 2003. Further, emissions data from Online Continuous Emission Monitoring Systems was not reliable due to non-upgradation of obsolete Online Continuous Emission Monitoring Systems.

### 2.5.3 Noise Pollution

As per the ambient noise levels stipulated by the Ministry of Environment, Forest and Climate Change and Renewal of Consent and Authorisation orders issued from time to time and valid up to 30 April 2023, ambient noise levels should be less than 75 and 70 decibels during day time (6 AM to 10 PM) and night time (10 PM to 6 AM) respectively. RINL monitors ambient noise levels at three places (Main Gate, Bala Cheruvu Gate and Coke and Coal Chemicals Department, Appikonda) during the day time as well as night time.

Audit reviewed the ambient noise levels for the period of three years ending 2019-20 and observed that the ambient noise levels were within the norms throughout the above period[14].

[14] ***Year wise minimum and maximum noise levels recorded ranged between 35 to 68.40 (2017-18), 35 to 69.10 (2018-19) and 31.10 to 69.10 (2019-20).***

### 2.5.4 Water Pollution

Used water in the Steel Plant contains harmful elements, viz., Phenols, Cyanide, Ammonia, Oil and Grease, Biochemical Oxygen Demand, Chemical Oxygen Demand, etc. These chemical contents have adverse effects on human beings and aquatic fauna.

#### 2.5.4.1 Discharge of effluents in excess of the standards

The Ministry of Environment, Forest and Climate Change, vide Notification dated 31 March 2012, set standards for different effluents for various production units of Integrated Iron and Steel Plants. The shortcomings in effluents discharged from different production units of RINL are as detailed below.

As per the above notification, the effluent standards for the Coke Ovens (Mechanical, Biological and Chemical Plant outlet) for Total Suspended Solids, Chemical Oxygen Demand[15] and Biochemical Oxygen Demand[16] are 100 milligrams per litre, 250 milligrams per litre and 30 milligrams per litre respectively. Inspections carried out by Andhra Pradesh Pollution Control Board on six occasions during the Audit period revealed that:

(i) Total suspended solids exceeded the standard of 100 milligrams per litre on four occasions and ranged between 107 and 160 milligrams per litre,

(ii) Chemical Oxygen Demand exceeded the standard of 250 milligrams per litre on four occasions and ranged between 272 and 368 milligrams per litre, and

(iii) Biochemical Oxygen Demand exceeded the standard of 30 milligrams per litre on five occasions and ranged between 54 and 92 milligrams per litre.

**Figure 2.3 – Discharge of untreated effluents**


**Discharge of untreated effluents into Gangavaram Creek**


**Discharge of untreated effluents into Appikonda Creek**

[15] ***Chemical Oxygen Demand is the total measurement of all chemicals (organic or inorganic) in the water/ wastewater.***

[16] ***Biochemical Oxygen Demand is the amount of dissolved oxygen needed by aerobic biological organisms to break down the organic material present in given water sample at certain temperature over a specific time period.***

Audit observed that as per the log books maintained by RINL for Mechanical, Biological and Chemical Plant outlet, the discharge of Chemical Oxygen Demand was within the standards on the inspection dates but as per the readings according to Andhra Pradesh Pollution Control Board equipment, the discharge of Chemical Oxygen Demand was in excess of norms indicating mismatch between readings by different equipment on same date.

Similarly, as against the standard for Biochemical Oxygen Demand for the Effluent Treatment Plant of 30 milligrams per litre, the effluents recorded by the Andhra Pradesh Pollution Control Board on six occasions ranged between 38 and 85 milligrams per litre. However, RINL had not measured the Biochemical Oxygen Demand on these six dates.

It is evident from the above facts that the measurements of effluents by RINL were not accurate and reliable. Since high Chemical Oxygen Demand/ Biochemical Oxygen Demand levels decrease the amount of dissolved oxygen available for aquatic organisms and cause reduced cell functioning, disrupt circulatory fluid balance in aquatic species and can result in death of individual organisms, necessary steps such as coagulants[17] and flocculants[18] to bind sludge together for their removal, control the PH of the stream, adding hydrogen peroxide to the waste water to remove organics in the waste water etc., may be taken to keep the Chemical Oxygen Demand/ Biochemical Oxygen Demand levels within the standards stipulated by the Ministry of Environment, Forest and Climate Change.

The Ministry of Steel (July 2021) and Management (April 2021) stated that steps such as providing additional facilities to optimise/ reduce the inlet toxic load such as introduction of Double Steam Stripping (distillation process), usage of chilled water, etc., are being taken up to enhance the biological treatment efficiency and to maintain the Chemical Oxygen Demand/ Biochemical Oxygen Demand levels within the stipulated standards of the Ministry of Environment, Forest and Climate Change and Andhra Pradesh Pollution Control Board.

The replies are not acceptable as the effluent levels at Mechanical, Biological and Chemical Plant outlet are being maintained within the norms only due to taking the monthly average of the levels. The fact remained that Total Suspended Solids, Chemical Oxygen Demand, and Biochemical Oxygen Demand levels on the dates of inspection carried by Andhra Pradesh Pollution Control Board at Mechanical, Biological and Chemical Plant outlet were higher than the standards stipulated by the Ministry of Environment, Forest and Climate Change and led to water pollution. Further, the replies were silent on the reasons for not measuring the Biochemical Oxygen Demand levels at

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[17] ***Coagulants are substances which cause particles in a liquid to curdle and clot together. Particles stay suspended in water rather than settling because they carry surface electrical charges that mutually repel each other.***

[18] ***Flocculants help to remove suspended solids from waste water by aggregating contaminants in waste water into 'flakes or flocs' that float to surface of the water or settle at the bottom.***

Effluent Treatment Plant on the dates of inspections carried out by Andhra Pradesh Pollution Control Board.

***Recommendation No. 6: RINL may take steps to ensure effluents from Mechanical, Biological and Chemical Plant and Effluent Treatment Plant are within the norms as stipulated by Ministry of Environment, Forest and Climate Change. For ensuring this, periodical reports may be furnished to the Board/Ministry so that progress may be monitored regularly.***

### 2.5.4.2 Delay in construction of guard ponds

Andhra Pradesh Pollution Control Board, by the Renewal of Consent and Authorization Order, directed (27 April 2015) RINL to carry out Bioassay[19] tests in "online bioassay testing facility" by providing four guard ponds with each pond having a capacity of 9,600 cubic meters for storing two days of treated effluents from Coke Oven Batteries. Once the water is stored, it shall be permitted to be discharged into the marine environment after its quality is cross checked by Andhra Pradesh Pollution Control Board. Out of the four guard ponds, three guard ponds would be operational simultaneously and one guard pond will be kept empty as reserve to store the effluents in case the effluents fail in bio-monitoring. Andhra Pradesh Pollution Control Board also directed RINL to submit Bioassay Reports and its impact on the marine life to the Regional Office of Andhra Pradesh Pollution Control Board, Visakhapatnam on monthly basis.

RINL belatedly issued (1 March 2018) Letter of Acceptance to M/s Sai Laxmi Enterprises for the construction of guard ponds with a completion period of 24 months (i.e., by 1 March 2020). The works were completed in September 2020 and the same are yet to be operational (July 2021).

**Figure 2.4: Guard Pond**

Management stated (April 2021) that the guard pond was operationally handed over to Works Department in September 2020 and upon clearance sought, Andhra Pradesh Pollution Control Board has suggested to establish the cameras with data storage along with data display facilities. As suggested by Andhra Pradesh Pollution Control Board, RINL is taking steps to complete this job and it is expected to be made operational shortly. The Ministry of Steel added (July 2021) that procurement of cameras and display units are in process and expected to be completed soon.

[19] ***Bioassay studies are carried out for evaluation of effects of liquid wastes on aquatic environment in which experimental organisms such as fish are subjected to a series of concentrations of a known or suspected toxicant under adequately controlled conditions for a stipulated period of time.***

Therefore, it can be seen that effluents discharged by plants of RINL were in excess of norms stipulated by Ministry of Environment, Forests and Climate Change. Further, measurement of effluents by RINL was not accurate and reliable. Due to delays in operationalisation of guard ponds as per directions of Andhra Pradesh Pollution Control Board, RINL is not being able to carry out tests to evaluate the effects of effluents in waste water on aquatic environment before being discharged into the sea.

### 2.5.5 Solid Waste Management

#### 2.5.5.1 Usage of high ash content boiler coal

Thermal Power Plant consumes boiler coal as fuel to generate steam required for generation of power. Indian coal possesses very high ash content. Ash, an inorganic matter present in coal, is responsible for release of many toxic elements into the environment by coal based industries. Knowing the environmental impact due to usage of coals with high ash content, the Ministry of Environment, Forest and Climate Change vide Notification dated 2 January 2014 directed all coal based Thermal Power Plants to use raw or blended or beneficiated coals with ash content, not exceeding 34 *per cent* on quarterly average.

Review of ash content of the indigenous boiler coal consumed by the Thermal Power Plant for the period of three years ended 31 March 2020 revealed that the ash content of boiler coal (indigenous) ranged between 43.87 *per cent* (2018-19) and 44.98 *per cent* (2019-20). High ash content in boiler coal (indigenous) may not only result in decreasing the calorific value but also result in generation of higher quantities of fly ash leading to air pollution.

As the indigenous boiler coal contains high ash content, experiments were reported (January 2010) by the Department of Industrial Chemistry, Post Graduate Centre, Bellary, Karnataka to reduce the ash content in the boiler coal. The results indicated that it was possible to remove nearly 75 *per cent* of the ash content in boiler coal by leaching[20]. Leaching of boiler coal with alkali such as Sodium Hydroxide or acids such as Hydrochloric Acid or Sulphuric Acid reduces the ash content in the boiler coal, thereby decreasing the generation of fly ash responsible for land and air pollution. Hence, RINL may also consider using some method like this to reduce the ash content in the boiler coal thereby decreasing the generation of fly ash, responsible for land and air pollution.

The Ministry of Steel stated (July 2021) that concept of leaching of boiler coal with alkali such as Sodium Hydroxide or acids such as Hydrochloric acid or Sulphuric acid to reduce the ash content is a new concept and may not be cost effective. It may be hazardous as it involves dealing with acids at the site. However, the techno economics of the leaching concept will be explored and will be considered accordingly.

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[20] ***Leaching is the process of a solute becoming detached or extracted from its carrier substance by way of a solvent.***

***Recommendation No. 7: RINL may explore various possibilities of reducing ash content in the boiler coal and choose suitable methodology to ensure that ash content is within prescribed norms.***

### 2.5.5.2 Non-disposal of fly ash

Fly ash generated from Thermal Power Plant is collected in slurry form and stored in the Ash Ponds. RINL also collects dry fly ash. Accumulation of fly ash leads to air and land pollution. To protect the environment, conserve top soil and prevent the dumping and disposal of fly ash discharged from coal or lignite based Thermal Power Plants on land, the Ministry of Environment, Forest and Climate Change, vide notification issued on 14 September 1999, directed that 100 *per cent* of fly ash generated from Thermal Power Plants should be disposed of by September 2008, which was subsequently extended up to 31 December 2017.

Further, the Ministry of Environment, Forest and Climate Change vide its notification dated 3 April 2007 stipulated that coal based Thermal Power Plants should not, at any point of time, store more than three months' ash generation in their storage and/ or ash ponds.

Review of generation, consumption and closing stock of fly ash for the period of three years ending 2019-20 revealed that 7,19,606 tonnes, 6,49,555 tonnes and 7,23,204 tonnes of fly ash was available as on 31 March of 2018, 2019 and 2020 respectively after disposal/ recycling of 41,710 tonnes and 7,93,913 tonnes of fly ash during the years 2018-19 and 2019-20. This indicates that RINL had not complied with the notifications issued by the Ministry of Environment, Forest and Climate Change mentioned *ibid*.

RINL could not comply with the notifications issued by the Ministry of Environment, Forest and Climate Change for 100 *per cent* disposal of fly ash due to the following reasons:

(i) RINL floated Expression of Interest six times during January 2007 to February 2016 for setting up of Blast Furnace Slag and Fly Ash Cement Plant through forming a joint venture by selection of a partner or consortium of partners. Three Committees and two Board Sub-Committees were formed for setting up a Cement Plant. Board of Directors approved the proposal and sent it to the Ministry of Steel for approval. However, the same was not approved by the Ministry of Steel and RINL was directed to explore the possibility of disbursing slag and fly ash in market to private players.

(ii) In response to the Expression of Interest floated on 28 December 2012 by Corporate Strategic Management Group to sell Blast Furnace slag and fly ash, M/s KCP Limited approached (17 March 2014) RINL to enter into a long term agreement for a period of 10 to 15 years for lifting of 7.50 lakh tonnes of Blast Furnace slag and 1.60 lakh tonnes of fly ash per annum from January 2015 as per the terms and conditions mutually agreed upon. However, RINL insisted for a minimum period of 30 years. Subsequently,

the Expression of Interest was foreclosed by the Marketing Department on 3 November 2014 with the approval of Director (Commercial).

As RINL failed to dispose the fly ash and accumulated fly ash nearly 14 meters in height, National Green Tribunal, vide its order dated 20 November 2018, directed RINL to deposit ₹1 crore with Central Pollution Control Board towards damages caused to environment. In compliance with the directions of the National Green Tribunal, RINL deposited (December 2018) ₹1 crore with Central Pollution Control Board, New Delhi.

Management stated (April 2021) that the proposal for setting up of a cement industry in coordination with M/s Cement Corporation of India Limited initiated by RINL long back was dropped by the Ministry of Steel and RINL was successful in disposing fly ash only to the extent possible.

The Ministry of Steel endorsed (July 2021) the reply of the Management.

Replies are not acceptable as RINL was not able to dispose of 100 *per cent* of fly ash as required under notifications issued by the Ministry of Environment, Forest and Climate Change by 31 December 2017. As on 31 March 2020, 7,23,204 tonnes of fly ash was lying in stock. This indicates that the efforts made by RINL for the disposal of fly ash were not adequate. Further, replies were silent on the Audit observation on failure of RINL to conclude long term agreement with M/s KCP Limited for a period of 15 years and thereby losing an opportunity to dispose of fly ash.

### 2.5.5.3 Non-disposal of Blast Furnace/ Steel Melting Shop slag

Blast Furnace slag and Steel Melting Shop slag are generated as by-products during the production of hot metal and liquid steel respectively. As per Charter on Corporate Responsibility for Environment Protection 2003, 100 *per cent* of Blast Furnace slag and Steel Melting Shop slag generated were to be utilised by 2007. However, it was observed that RINL could not comply with this stipulation. Percentage of utilisation of Blast Furnace slag for the three-year period ending 2019-20 ranged between 21 *per cent* (2019-20) and 32 *per cent* (2018-19). Percentage of utilisation of Steel Melting Shop slag for the three-year period ending 2019-20 ranged between 9 *per cent* (2017-18) and 16 *per cent* (2019-20).

In this regard, Audit observed that -

i) Environmental Impact Assessment/ Environmental Management Plan prepared for the Modernisation Project for Capacity Expansion up to 7.3 million tonnes per annum envisaged that 100 *per cent* of the Blast Furnace granulated slag would be sold to cement industry and 60 *per cent* of Steel Melting Shop slag would be used within the Steel Plant and the balance Steel Melting Shop slag would be stored for secondary processes. However, Blast Furnace and Steel Melting Shop slags were neither sold nor used within the Steel Plant. This was stated to be due to non-materialisation of Cement Plant, as mentioned in Para No. 2.5.5.2 *supra* and non-utilisation of the slag within the Steel Plant.

ii) An Attrition Grinding Unit to improve the bulk density of Blast Furnace granulated slag from 1.0 to 1.5 kilograms per litre was proposed to be installed as stipulated in the Environmental Clearance given in June 2019 for the Modernisation Project for capacity expansion to 7.3 million tonnes per annum. The slag, after such improvement of bulk density, was proposed to be utilised as river sand for use in construction industry. However, the same has not materialised till date (July 2021).

**Figure 2.5 – Accumulation of Blast Furnace Slag and Steel Melting Shop Slag**


**Blast Furnace Slag storage area**


**Steel Melting Shop (Linz-Donawitz) Slag storage area**

As regards non-disposal of Blast Furnace slag, Management, while explaining its efforts for the sale of Blast Furnace slag, stated (April 2021) that continuous efforts were being made to increase the sales by increasing the customer base. Despite efforts made by it for disposal, it could not dispose of 100 *per cent* of Blast Furnace slag generated, as envisaged in the Environmental Impact Assessment/ Environmental Management Plan prepared for the Modernisation Project for Capacity Expansion up to 7.3 million tonnes per annum. The Ministry of Steel added (July 2021) that all efforts were made for sale of Blast Furnace slag to cement industries.

The reply of the Ministry of Steel is not acceptable since RINL was able to dispose of the fresh slag generated only but the fact remains that the Blast Furnace slag existing in the dump yard has not yet been disposed of, as pointed out in the Audit Observation. The fact remains that closing stock of the Blast Furnace slag in the dump yard as on 31 March 2021 was 51.09 lakh tonnes. Further, the replies were silent on the Audit Observation on non-materialisation of its proposal for installation of Attrition Grinding Unit to use Blast Furnace granulated slag as river sand for use in construction industry, as stipulated in the Environmental Clearance given in June 2019 for the Modernisation Project for Capacity Expansion up to 7.3 million tonnes per annum.

For non-disposal of Steel Melting Shop slag, Management stated (April 2021) that about 5 *per cent* of steel scrap was recovered and recycled and the balance portion of the slag free from steel scrap was disposed for internal consumption as well as external sales together

by about 17 *per cent* in 2017-18, 19 *per cent* in 2018-19 and 31 *per cent* in 2019-20. The Ministry of Steel added (July 2021) that all efforts were made for disposal of the material.

The fact remains that disposal for internal consumption as well as external sales for three years ending 2019-20 was much below in comparison to envisaged usage of 60 *per cent* in Environmental Impact Assessment/ Environmental Management Plan. Thus, the efforts made for disposal of the Steel Melting Shop slag were not adequate to comply with the Charter on Corporate Responsibility for Environment Protection 2003 requirement of utilising 100 *per cent* Steel Melting Shop slag by 2007.

***Recommendation No. 8: RINL may explore various alternatives for effective utilization of Blast Furnace/ Steel Melting Shop slag and fly ash.***

### 2.5.6 Hazardous Waste

Steel Plant generates hazardous wastes such as Tar Sludge, Benzol Acid Sludge, Used Oil, etc. Disposal and recycling of such wastes on land affects the soil and water and leads to environmental problems. RINL is recycling most of the sludge generated from various units such as Mechanical, Biological and Chemical Plant and Effluent Treatment Plant, which are being recycled in the Coke Oven Batteries. Oil sludge/ waste grease from all over the Plant is being sold to authorised parties.

Andhra Pradesh Pollution Control Board granted authorisation through its Renewal of Consent and Authorisation Orders (valid up to 30 April 2023) to RINL to operate a facility for collection, storage, treatment, transportation and disposal of hazardous wastes such as Effluent Treatment Plant sludge, Used oil/ Waste oil, Tank bottom sludge, Tar sludge, Acid tar, Benzol sludge, etc. As per the Renewal of Consent and Authorisation Orders issued by Andhra Pradesh Pollution Control Board from time to time, RINL should not generate, dispose and recycle the hazardous wastes in excess of the quantities indicated in the above orders.

Andhra Pradesh Pollution Control Board granted authorisation (27 April 2015 and 28 February 2017) for the generation and recycling of Effluent Treatment Plant sludge from Mechanical, Biological and Chemical Plant and Effluent Treatment Plant of 250-300 tonnes per annum and 2,125 tonnes per annum respectively. As per the Environmental Impact Assessment/ Environmental Management Plan prepared for the Modernisation Project (for Capacity Expansion up to 7.3 million tonnes per annum) in January 2019, the total quantity of generation of Effluent Treatment Plant sludge was projected as 6,145 tonnes per annum. However, the earlier authorised quantities (2,125 tonnes per annum) were authorised to continue till 30 April 2023 as per the Consent for Operation and Hazardous Waste Authorisation Order issued by Andhra Pradesh Pollution Control Board on 6 February 2019.

During the period from 2017-18 to 2019-20, the quantities of Hazardous Wastes authorized vis-à-vis generated and recycled are as follows:

**Table 2.4: Hazardous Waste Authorised vis-à-vis Generated/ Recycled**

**(Quantity in tonnes)**

| Year | Hazardous Waste Authorised with recycling option | Hazardous Waste Generated/ Recycled |
|---|---|---|
| 2017-18 | 2,125 | 4,916.10 |
| 2018-19 | 2,125 | 5,595.58 |
| 2019-20 | 2,125 | 3,959.74 |

Keeping in view the above gap in the collection and recycling of hazardous wastes as well as stabilisation of Effluent Treatment Plant, RINL approached Andhra Pradesh Pollution Control Board belatedly on 22 February 2019 for the enhancement of limit for hazardous wastes with recycling option (Effluent Treatment Plant sludge from Mechanical, Biological and Chemical Plant and Effluent Treatment Plant) as 4,250 tonnes per annum though the actual quantity generated and recycled during 2018-19 was higher at 5,595.58 tonnes per annum and also the higher projected quantity of 6,145 tonnes per annum as included in the Environmental Impact Assessment/ Environmental Management Plan for Capacity Expansion up to 7.3 million tonnes per annum. Authorisation for the additional quantities of hazardous wastes is awaited from the Andhra Pradesh Pollution Control Board (July 2021).

Management, while explaining its efforts to get authorisation from Andhra Pradesh Pollution Control Board for enhanced quantities, stated (April 2021) that RINL was waiting for the amended Consent for Establishment from Andhra Pradesh Pollution Control Board. The Ministry of Steel added (July 2021) that the Consent for Establishment for 7.3 million tonnes per annum was awarded on 15 March 2021 and RINL has accordingly applied for Consent for Operations with enhanced quantities of Hazardous Waste and the same was still awaited (July 2021).

The fact remains that RINL is generating hazardous waste of additional quantities (though the same is being recycled also) after expansion and modernisation without any authorisation.

### 2.5.7 Conservation of Natural Resources

Steel industry is a resource-intensive industry. Extraction, transportation of raw materials for steel-making and production have an adverse impact on the environment. Efficient use of these natural resources is critical for the sustainability of the steel industry. Though specific consumption of water for entire RINL was within the target stipulated in Charter on Corporate Responsibility for Environmental Protection, 2003 as well as its own Sustainability Plan Targets, specific consumption of energy for entire RINL and fuel consumption rate in Blast Furnaces were not within the Sustainability Plan Targets, as detailed in the paras 2.5.7.2 to 2.5.7.4 *infra*.

#### 2.5.7.1 Specific consumption of water

As per Charter on Corporate Responsibility for Environmental Protection, 2003, RINL should reduce specific water consumption to 5 cubic meter/tonne of liquid steel by

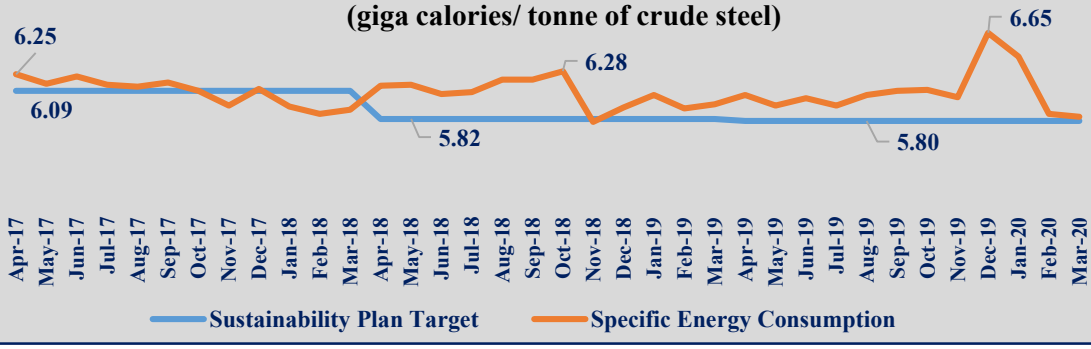
December 2005. Audit reviewed the specific water consumption for the period of three years ending 2019-20 and observed that the specific water consumption was within the norms[21] specified throughout the above period.

### 2.5.7.2 Excess consumption of specific energy over and above the targets

The main constituents of energy in RINL are power, boiler coal, coke and by-product gases generated in the process of production of coke, hot metal and liquid steel. Since energy mainly comes from the burning of coal, a non-renewable source of natural resource, utmost priority should be given to utilise energy judiciously so as to conserve the resources as well as to reduce the Green House Gases.

To reduce the specific energy consumption in terms of giga calories per tonne of crude steel, RINL fixed Sustainability Plan Targets from time to time. After completion of the major revamping works, under capacity expansion to 7.3 million tonnes per annum, during 2017-18, these targets were fixed at lower levels in 2018-19 and 2019-20 as capacity expansion was expected to result in reduction in specific energy consumption. However, it was observed that though the specific consumption of energy was largely within the target stipulated in the Sustainability Plan for the year 2017-18, the specific consumption of energy was mostly in excess of the Sustainability Plan Targets during the years 2018-19 and 2019-20 as shown below:

**Chart 2.8 - Specific Energy Consumption during 2017-18 to 2019-20**
**RINL Sustainability Plan Target vis-a-vis Actuals**
**(giga calories/ tonne of crude steel)**




The reasons for the consumption of specific energy in excess of targets for the years 2018-19 and 2019-20 included high fuel consumption rate, increased consumption of power in Blast Furnaces and Steel Melting Shops, higher tap to tap time[22] in Steel Melting Shops and excess consumption of auxiliary power in Thermal Power Plant.

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[21] ***RINL had set a target of consumption of 2.75, 2.33 and 2.29 cubic meter of water/tonne of liquid steel for the years 2017-18 to 2019-20 against which actual achievement was 2.40, 2.32 and 2.27 cubic meter of water/tonne of liquid steel respectively.***

[22] ***Tap to Tap time is the time between two tapings of liquid steel from Converter (termed as a cycle). Tap to Tap time is arrived as total no. of cycles in a month divided by total converter hours, which includes idle time. If the Tap to Tap time is higher, it will consume more energy.***

Thus, failure to keep the specific consumption of energy within the targets for the years 2018-19 and 2019-20 resulted in excess consumption of 18.84 lakh giga calories. Further, considering that each Mega Watt Hour of electricity from Thermal Power Plant emits 960 kilograms of $CO_2$ emissions, excess consumption of energy also contributed to increase in $CO_2$ emissions by 20.98 lakh tonnes. Necessary steps such as optimum usage of coke, coal, power, etc., may be taken to keep the specific energy consumption within the Sustainability Plan targets, to minimise investment on energy and control $CO_2$ emissions which contribute to global warming.

Management indicated (April 2021) the steps taken such as increasing the capacity utilisation of all production processes to reduce idle running of equipment, increasing the Pulverised Coal Injection in Blast Furnaces, etc., to keep the specific energy consumption within the Sustainability Plan Targets and to minimise $CO_2$ emissions. The Ministry of Steel assured (July 2021) that necessary measures as suggested by Audit shall be implemented to reduce specific energy consumption.

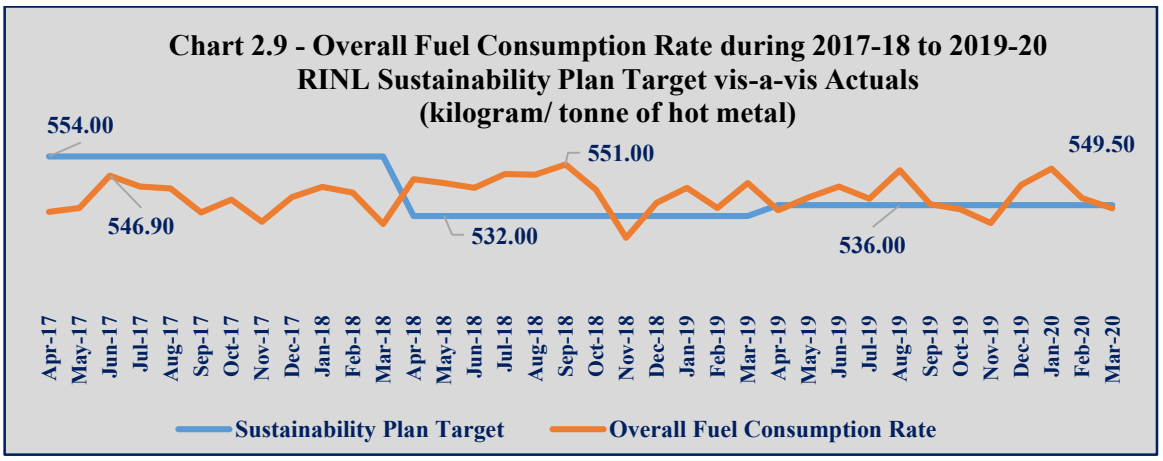
***Recommendation No. 9: RINL may strive to achieve its Sustainability Plan targets for reduction of specific energy consumption by optimum usage of coke, coal and power, etc. For ensuring this, periodical progress reports may be furnished to the Board/Ministry regularly for their monitoring.***

#### 2.5.7.3 Excess Green House Gas emissions due to excess fuel consumption rate in Blast Furnaces

RINL consumes Blast Furnace coke, nut coke and pulverised coal in its three Blast Furnaces as fuel and to reduce oxides present in the iron ore. Blast Furnace coke, nut coke and pulverised coal are produced from coal, a non-renewable source of energy. RINL fixed targets from time to time for consumption of overall fuel consumption rate[23] for the Blast Furnaces. After completing Category-I Capital Repairs of Blast Furnaces No. 1 and 2 and some other major revamping works during 2017-18, these targets were fixed at lower levels in 2018-19 and 2019-20 in comparison to targets of 2017-18 as reduction was expected in fuel consumption after completion of Category-I Capital Repairs.

Review of the overall fuel consumption rate of the blast furnaces for the period of three years ending 2019-20 revealed that it was mostly in excess of the Sustainability Plan Targets in the years 2018-19 and 2019-20 as indicated below:

[23] ***Overall fuel consumption rate is the sum of Blast Furnace coke, nut coke and pulverised coal consumed in its three Blast Furnaces per one tonne of hot metal.***




The excess consumption of fuel was due to operation of blast furnaces in restricted regime[24]. On an average, the reduction of one kilogram of fuel consumption rate results in reduction of 3.14 kilogram of $CO_2$ emissions. Consumption of fuel in Blast Furnaces over and above the Sustainability Plan Targets for the two years ending 2019-20 resulted in excess consumption of 0.73 lakh tonnes of fuel and excess emission of 2.30 lakh tonnes of Green House Gases thereby adversely affecting the atmosphere. Since excess consumption of fuel has an adverse impact on environment, RINL should take all necessary steps such as optimum usage of coke and adoption of technologies like Pulverised Coal Injection, Oxygen Enrichment, etc., to keep the overall fuel consumption rate within the Sustainability Plan Targets.

Management stated (April 2021) that consumption of fuel for hot metal production is directly proportional to consistent and steady state of operation of Blast Furnace. It also stated that the desired fuel consumption rate could not be achieved due to operation of Blast Furnaces under restricted regime because of a variety of reasons such as shortage of raw materials, oxygen, etc. The Ministry of Steel added (July 2021) that RINL considered all the requirements and accordingly planned the revamping of Sinter Plant and the Oxygen requirements. However, some delays occurred due to various extensions for receipt of offers, in resolving techno-commercial issues with tenderers and price negotiations.

Though it is true that consumption of fuel for hot metal production is directly proportional to consistent and steady state of operation of Blast Furnaces, the fact remained that Blast Furnaces were not operated at optimum levels after their Category-I capital repairs due to shortage of raw materials such as sinter, coke, etc., and lack of adequate oxygen. Shortage of sinter was due to non-revamping of outlived Sinter Machines No. 1 and 2 along with Category-I capital repairs of Blast Furnaces No. 1 and 2. Shortage of coke was attributable to lack of proper planning in transfer of coke available at the coke yard to

[24] ***Even after conducting Category-I Capital Repairs to Blast Furnaces No. 1 and 2, non-synchronization of revamping of upstream and downstream facilities led to operation of these Blast Furnaces in restricted regime. Operating at restricted regime resulted in higher thermal regime i.e. operating furnaces at temperatures higher than the average leading to excess coke consumption.***

Blast Furnaces. Shortage of oxygen was due to delay in purchase of adequate oxygen required for Blast Furnaces after Category-I capital repairs.

Operation of Blast Furnaces under restricted regime due to the above mentioned shortages could have been avoided, had RINL (i) planned and completed revamping of outlived Sinter Machines No. 1 and 2 along with Category-I capital repairs of Blast Furnaces No. 1 and 2; (ii) purchased adequate quantities of oxygen; and (iii) properly planned logistic arrangements for supply of coke to Blast Furnaces.

### 2.5.7.4 Delay in implementation of Zero Water Discharge Scheme

To conserve water, RINL proposed (September 2007) to implement Zero Water Discharge scheme as a Corporate Objective. As per the Zero Water Discharge scheme, a total 1,180–1,280 cubic meter per hour of waste water expected to be discharged from three outlets (viz., Bala Cheruvu, Gangavaram and Appikonda) in future was required to be brought down closer to zero. It was also envisaged in the scheme to treat part quantity of waste water to make up water quality and balance to soft water quality for reuse in the Plant and thereby save ₹15 crore per annum from the scheme by recycling of 20,251.95 cubic meter per day of water. Board of Directors accorded (September 2007) approval for implementation of 'Waste Water Collection, Treatment and Reuse' to achieve Zero Water Discharge Scheme at an estimated cost of ₹114.85 crore. Andhra Pradesh Pollution Control Board also directed (October 2008) that zero water discharge scheme should be made operational by December 2010.

In compliance to the approval of the Board of Directors, RINL placed (May and June 2008) Letters of Acceptance on the Consortium of M/s Permionics Membranes Private Limited and M/s Ariff De Tox Incineration Limited, for the entire works of Transfer Pumping Stations, Bala Cheruvu Water Treatment, existing Sewage Treatment Plant Tertiary Treatment by Reverse Osmosis and associated works at a total cost of ₹62.64 crore. As per the Letters of Acceptances awarded to the Consortium, the entire works were to be completed by 14 October 2009. As the works could not be completed even after granting 15 and 14 extensions respectively, RINL terminated (May 2016) the contracts and the leftover works valuing ₹3.19 crore (2008 estimates) were awarded (September 2017) to M/s Effwa Infra and Research Private Limited at a total cost of ₹23.88 crore thus incurring an additional expenditure of ₹14.38 crore[25]. As against the scheduled completion period of six months (i.e., by March 2018), the leftover works were completed in March 2019. However, linkage with existing Treatment Plants, Guard Ponds and Marine Pipeline is yet to be completed.

As against the direction (October 2008) of Andhra Pradesh Pollution Control Board to implement Zero Water Discharge Scheme by December 2010, the Scheme is yet to be

[25] ***a) Estimated cost of the leftover works: ₹3.19 crore; b) Awarded value of the leftover works: ₹23.88 crore; c) Amount recovered from the defaulted contractor: ₹6.31 crore. Additional expenditure equals ₹14.38 crore {(b) - (a+c}).***

completed and hence, RINL could not conserve the targeted quantity of water, as envisaged under its Corporate Objective.

Management stated (April 2021) that, on completion of the Zero Water Discharge scheme, five million gallons per day of water would be recovered and would result in further reduction of water consumption. The Ministry of Steel added (July 2021) that after commissioning of all zero discharge units, all efforts were being made to run these units at their full capacity but due to inadequacy of waste water and other related problems these units did not yield the rated output. RINLwould soon overcome the problem and would be in a possition to retrieve maximum water out of these units.

Reply needs to be viewed against the fact that RINL could not run various units of Zero Water Discharge Scheme and recover 5.35 million gallons per day of water due to non-linkage of guard ponds with marine pipeline (completed in August 2011) resulting in the residual pollutants from Effluent Treatment Plants being directly discharged into sea through Appikonda and Gangavaram creeks leading to water pollution. Further, RINL is yet to recover the risk and extra cost from the Consortium of M/s Permionics Membranes Private Limited and M/s Ariff De Tox Incineration Limited (July 2021).

## 2.6 Role of Andhra Pradesh Pollution Control Board

Andhra Pradesh Pollution Control Board (Board) is a Statutory Authority constituted by Government of Andhra Pradesh under the powers conferred by Section 4 of the Water (Prevention and Control of Pollution) Act, 1974 (Act). Initially constituted to implement the provisions of the Act, the Board was made responsible for implementation of provisions of other Environmental Legislation enacted subsequently.

The environmental laws and rules largely provide the Board a predominant role in monitoring of compliance with the provisions of these laws and rules by industries, municipal authorities, hospitals, etc. The Board is responsible for collection and dissemination of information relating to pollution, planning comprehensive programmes and advising the State Government for prevention, control or abatement of pollution. To enable it to discharge the mandated functions effectively, the Board has been vested with powers to obtain information from the industries, inspect and collect samples of effluents/ emissions, grant/ reject/ withdraw Consent for Establishment/ Operation of any industry, operation or process, to approach Courts for restraining persons causing pollution, etc.

In discharge of its functions, the Board conducted inspection of RINL on six occasions and issued eight show cause notices during the Audit period. It also conducted randomised risk based inspection in January 2020 and issued 22 directions on 11 March 2020 for compliance. It also advised RINL to give a Bank Guarantee for an amount of ₹20 lakh with validity period up to 31 May 2022. Accordingly, RINL has given Bank Guarantee for ₹20 lakh with validity period up to 31 May 2022.

It was observed from the records of RINL that it failed to keep the emissions (both fugitive and charging emissions) under control. It also failed to comply with the norms

specified as per the Notifications/ Directions of the Ministry of Environment, Forest and Climate Change/ Andhra Pradesh Pollution Control Board relating to excess Carbon Monoxide emissions, excess $PM_{10}$ emissions from stacks, excess flaring of Blast Furnace Gas, discharge of effluents in excess of standards, non-disposal of Blast Furnace/ Steel Melting Shop slag, generation and recycling of hazardous waste without authorisation, etc. Despite this, Andhra Pradesh Pollution Control Board did not take cognisance of the excess emissions/ non-compliances and make it a part of their Inspection Reports and take corrective action in this regard.

After the above issues were highlighted by Audit, the Board replied (July 2021) that the compliance submitted for directions issued on 11 March 2020 was verified by inspecting RINL on 26 June 2021 and it was noticed that the non-compliances, as reported by Audit, were still continuing during its inspection on 26 June 2021. Hence, Board proposed to forfeit the Bank Guarantee of ₹20 lakh for non-compliance of its directions/ conditions/ standards.

Based on the observations of Audit, the Board decided to place RINL before Task Force Committee for review and take necessary action including levy of suitable Environmental Compensation.

***Recommendation No. 10: Andhra Pradesh Pollution Control Board may consider reviewing the commitments given by RINL to keep the pollution levels within the norms and take appropriate timely action against RINL, as deemed fit.***

## 2.7 Good Practices at RINL

Audit also observed certain good practices being followed by RINL in controlling environmental pollution. These are given below:

(i) RINL installed waste energy recovery technologies to recover waste energy for generation of electricity such as – (a) 20.60 MW New Energy and Industrial Technology Development Organisation Model Project attached to Sinter Plant; (b) 38 MW Top Pressure Recovery Turbines attached to Blast Furnaces; and (c) 15 MW Back Pressure Turbine Station and 13 MW Condensing Extraction Turbine attached to Coke Oven Batteries. RINL is meeting 56 *per cent* of power requirement through utilization of waste energies at present.

(ii) Adoption of state of art cleaner technologies such as Coke Dry Quenching Plant wherein hot coke from the coke oven is cooled by circulating nitrogen gas in a closed circuit and the sensible heat of coke, which was earlier diffused into atmosphere, is now tapped to generate steam for producing electricity.

(iii) Capacity Expansion Project to 7.3 million tonnes per annum of liquid steel has been taken up with energy efficient features (energy efficient burners, motors, star rated air conditioners, variable frequency drives in electrical systems, etc.) which save energy and yield higher productivity.

The existing energy efficient measures are helping in reduction of energy consumption by 2,22,842 tonnes of oil equivalent and Green House Gas emissions by 13.32 lakh tonnes annually. After completion of the Expansion and Modernisation Projects, the specific energy consumption is estimated to be reduced by five lakh tonnes of oil equivalent.

## 2.8 Conclusion

As Steel Plants are one of the highly polluting industries, compliance to various regulations made for protection of the environment is of utmost importance. Accordingly, this Audit was taken up to assess extent of compliance by RINL to Acts/ Rules/ Notifications framed by Government of India/ State Government.

It was observed that RINL commenced operations under Capacity Expansion from 6.3 to 7.3 million tonnes per annum without obtaining Environmental Clearance from the Ministry of Environment, Forest and Climate Change as required vide Notification of the Ministry dated 14 September 2006.

Abatement of Air Pollution requires emission of certain gases/ substances to be kept within the prescribed norms. Audit noticed higher levels/emissions of Carbon Monoxide, Carbon Di Oxide, $PM_{10}$ when compared with Sustainability Plan targets and norms stipulated by regulatory bodies. There were excess fugitive emissions from Coke Oven Batteries. RINL had not rebuilt its older Coke Oven Batteries as required under Charter on Corporate Responsibility for Environment Protection, 2003. Further, emissions data from Online Continuous Emission Monitoring Systems was not reliable due to non-upgradation of obsolete Online Continuous Emission Monitoring Systems.

Specific energy consumption in the Plant and overall fuel consumption rate in Blast Furnaces were in excess of the targets stipulated in RINL's Sustainability Plan leading to release of excessive Green House Gases. On water pollution front also, effluents discharged by plants of RINL were in excess of the norms stipulated by the Ministry of Environment, Forest and Climate Change.

Further, usage of high ash content boiler coal in Thermal Power Plant for power generation led to generation of higher quantities of fly ash. Non-utilisation of this fly ash in line with the Notifications issued by the Ministry of Environment, Forest and Climate Change led to water, air and land pollution. There has been accumulation of Blast Furnace/ Steel Melting Shop slags leading to air and land pollution.

It was also noticed that Andhra Pradesh Pollution Control Board failed to arrest the continuous non-compliance by RINL to the norms stipulated by regulatory authorities with reference to emissions, flaring of gases, installation of equipment, generation of hazardous waste in excess of authorisation, etc., and failed to take necessary action during various inspections of the Plant.

Thus, RINL needs to improve its Environment Management System to ensure compliance with various deficiencies due to non-compliance with emission norms, non-upgradation of pollution monitoring/ controlling equipment, non-revamping of old and pollution causing production machineries etc.

**New Delhi**
**Dated: 31.03.2022**

**(R.G. Viswanathan)**
**Deputy Comptroller and Auditor General**
**(Commercial) and Chairman, Audit Board**

**Countersigned**

**New Delhi**
**Dated: 31.03.2022**

**(Girish Chandra Murmu)**
**Comptroller and Auditor General of India**

# ANNEXURE

*Annexure-I*
*{As referred to in Para 1.6.2.2(iii)}*

**Table indicating the Auxiliary Packages for Category-I Capital Repairs of Blast Furnaces**

| Sl. No. | Package Description | Awarded Value (₹ in crore) | Scheduled Date of Start | Scheduled Date of Completion | Actual Date of Completion | Liquidated Damages Recovered (₹ in lakh) |
|---|---|---|---|---|---|---|
| **Blast Furnace No. 1** | | | | | | |
| 1 | Civil Structural Steel & Sheeting/ Cladding Works | 26.08 | 15-Nov-11 | 14-Mar-13 | 30-Nov-15 | No Liquidated Damages recovered |
| 2 | Augmentation of Water System | 41.25 | 4-Jan-12 | 4-Jul-13 | 31-Jul-14 | 583.96 |
| 3 | Cast House Fume Exhaust System | 24.85 | 9-Jan-12 | 18-May-13 | 31-Jul-14 | 337.15 |
| 4 | De-dusting system for Stock House | 36.03 | 25-Feb-12 | 24-Jun-13 | 31-Jul-14 | 480.14 |
| 5 | Upgradation of Telecommunication System for Blast Furnace No. 1 | 0.41 | Work was initially awarded in Jan-12, but due to non-completion by original contractor this was re-awarded to other contractor in January 2019 | 3-May-19 | 24-Oct-19 | In process |
| 6 | Fire Detection and Alarm and Fire Protection System | 6.37 | 30-Nov-12 | 29-Nov-13 | 17-Dec-15 | 32.81 |
| 7 | No. 2 Hopper Bell less Top Charging Equipment | 49.54 | 27-Feb-12 | 15-Mar-13 | 19-Aug-14 | 165.42 |
| 8 | Mud Gun and Drilling Machine | 35.88 | 27-Jul-12 | 15-Jun-13 | 14-Mar-15 | 48.06 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Blast Furnace No. 2** | | | | | | |
| 1 | Fire Detection and Alarm and Fire Protection System | 5.14 | 14-Jun-15 | 13-Aug-15 | 15-Jan-18 | 35.47 |
| 2 | Bell Less Top Charging Equipment | 66.82 | 29-Sep-14 | 20-Mar-16 | 27-Oct-17 | No Liquidated Damages recovered |
| 3 | Revamping and Upgradation of De-dusting System for Stock House | 33.83 | 11-Dec-14 | 10-Apr-16 | 21-Oct-17 | 144.08 |
| 4 | Revamping and Upgradation of Cast House Fume Exhaust System | 39.60 | 8-Jan-15 | 7-May-16 | 28-Nov-19 | 252.65 |
| 5 | Upgradation of Telecommunication System for Blast Furnace No. 2 | 2.25 | Work was initially awarded in June-15 but due to non-completion by original contractor this was re-awarded to other contractor in January 2019 | 2-Dec-19 | 31-Mar-21 | In process |