

PRE-FEASIBILITY REPORT

FOR

**EXPANSION OF CHALIYAMA STEEL PLANT
(2.8805 MTPA to 7.0185 MTPA STEEL)**

AT

**VILLAGES CHALIYAMA, BANKASAI, KUJU,
ARAHASA AND MEDKI
DISTRICT SARAIKELA - KHARSAWAN,
JHARKHAND**

(EXISTING : 933.44 ACRE [377.75 HA.]

PROPOSED : 449.09 ACRE [181.74 HA.]

TOTAL : 1382.53 ACRE [559.49 HA.]

JULY, 2021

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1.0 EXECUTIVE SUMMARY

Project name	Expansion of Chaliyama Steel Plant
Project proponent	Rungta Mines Limited
Location	Villages Chaliyama, Bankasai, Kuju, Arahasa and Medki District Saraikela – Kharsawan, Jharkhand
Latitude (as per google earth as on 12.07.2021)	22°33'22.03" to 22°37'5.06" N 85°52'22.60" to 85°55'14.12" E
Total Area	Existing : 933.44 acres (377.75 ha) Proposed : 449.09 acres (181.74 ha) Total : 1382.53 acres (559.49 ha)
Status of Land	449.09 acres additionally required which consists of 328.64 acres is private land and 120.45 acres is government land. It is to be acquired.
Product	Steel, Power, Pellet and surplus of sponge iron, hot metal from blast furnace and sinter.
Rated capacity existing & Proposed	<ol style="list-style-type: none"> 1. DRI from 2,477,900 to 4,203,200 TPA 2. Mini Blast Furnace from 1,550,045 to 4,591,545 TPD 3. SMS from 2,880,500 to 7,018,500 TPA 4. Billets from 2,822,890 to 6,919,510 TPA 5. Continuous casting machine from 9X 4 to 16X4 strand 6. Rolling mill from 3,227,964 to 7,167,964 TPA 7. Power plant from 657 to 1,252 MW 8. Pelletisation plant from 25,000,000 TPA, no change 9. Coal washery 1,260,000 TPA, no change 10. Oxygen plant from 600 to 3,000 TPD 11. Lime Plant from 171,500 to 633,500 TPA 12. Vacuum Degassing from 130 T, No Change 13. RH/VD/AOD 295 T, New 14. Ferro Alloy Plant from 54,000 TPA, no change 15. Sinter Plant from 2,101,572 to 6,754,572 TPA 16. Coke Oven plant from 910,000 to 2,590,000 TPA 17. Producer Gas Plant from 661,000 Nm³/hr, no change 18. Cement Plant from 2,805,000 to 4,357,500 TPA
Working days	Existing: 355 Proposed: 355
Manpower	Existing: 5,530 Proposed Additional : 1,800 Total : 7,330

Expected cost of the project	Existing : Rs. 9,654.97 Cr. Proposed Additional : Rs. 11,650 Cr. Total : Rs. 21,304.97 Cr.
Water requirement	Existing : 4,200 cum/hr Proposed Additional : 2,466 cum/hr Total : 6,666 cum/hr
Source of water	Kharkai river and rain water harvesting
Power requirement	Existing : 621 MW Proposed Additional : 510 MW Total : 1131 MW
Power source	Captive Power Plant
Implementation Schedule	84 months from the date of EC

2.0 INTRODUCTION

2.1 Identification of project and project proponent

Rungta Mines Ltd. (RML) has been working in the mining business since the last 6 decades and has established several steel & power plant in Odisha & Jharkhand and has remained debt-free.

This plant obtained EC for 0.7854 MTPA Steel vide letter no. J-11011/305/2012-IA.II(I) dated 07.08.2018 and its enhancement dated 28.01.2019 and 17.06.2019. The plant has obtained enhancement from 0.7854 MTPA to 1.0395 MTPA vide letter no J-11011/305/2012-IA.II(I) dated 27.08.2020. The plant has obtained EC for expansion from 1.0395 to 2.8805 vide letter no J-11011/305/2012-IA-II(I) dated 19.01.2021. Manufacturing facilities as per EC is given in **Table 1**.

TABLE 1: MANUFACTURING FACILITIES AND PRODUCTION SANCTIONED IN EC

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021
(1)	(2)	(3)	(4)
	TOTAL PRODUCTION	MTPA	2.8805
1	DRI Plant		
1.1	DRI (7X100 TPD kiln)	TPA	360,325
1.2	DRI (1X100 TPD kiln)	TPA	51,475
1.3	DRI (2X350 TPD kiln)	TPA	340,800
1.4	DRI (4 X 900 TPD)	TPA	1,725,300
	Sub Total	TPA	2,477,900
2	Mini Blast Furnace		
2.1	MBF-1	TPA	696,920 (1x524 cum)
2.2	MBF-2	TPA	853,125 (1 X 650 cum)
	Sub Total	TPA	1,550,045

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021
(1)	(2)	(3)	(4)
3.0	SMS		
3.1	SMS (I) via IF Route	TPA	346,500 (IF 4x15 T, LRF 3x20 T)
3.2	SMS (II) via IF Route	TPA	346,500 (IF 4x15 T, LRF 2x35T)
3.3	SMS (III) via IF Route	TPA	346,500 (IF 4X15T, LRF 2X35 T)
3.4	SMS (IV) via IF Route	TPA	1,001,000 (IF 13X20T, LRF 4X45T)
3.5	SMS (V) EAF/ BOF EOF Rout-1	TPA	840,000 (EAF/ EOF 1x100T or BOF 1x75T or AOD 1x100T)
		Total	2,880,500
4	Billets/slab/bloom caster		
4.1	Billet caster (I)	TPA	339,570
4.2	Billets caster (II)	TPA	339,570
4.3	Billets caster (III)	TPA	339,570
4.4	Billets caster (IV)	TPA	980,980
4.4	Billets caster (V)	TPA	823,200
		Total	2,822,890
5	Continuous casting machine		9x4 strand
6	Rolling mill (TMT/ flat/ Round/ wire rod/ structural mill/ others)		
6.1	Rolling mill (I)	TPA	325,988
6.2	Rolling mill (II)	TPA	325,988
6.3	Rolling mill (III)	TPA	325,988
6.4	Rolling mill with Annealing & Pickling & Galvanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others)	TPA	1,550,000 (1X0.5 + 1X0.45 + 2X0.3 MTPA)
6.5	Rolling mill with Pickling & Galvanizing line (strip mill / sheet / coil/wire rod/structural / others)	TPA	200,000
6.6	Ductile Pipe Plant	TPA	500,000 (1X0.2 + 1X 0.3 MTPA)
		Total	3,227,964
7	Captive Power Plant	MW	657
7.1	WHRB	MW	229
7.2	AFBC/ CFBC	MW	420
7.3	TRT	MW	8
7.4	TG	MW	5x20+2x40+9x25+2x65+1x70+2x30
8	Pelletisation plant	TPA	25,000,000 (5 X 3 MTPA+10 X 1 MTPA)
9	Coal washery	TPA	1,260,000
10	Oxygen	cum/annum	161,700,000 (1X100 + 2X150 + 1x200 TPD)
11	Lime Plant	TPA	171,500

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021
(1)	(2)	(3)	(4)
			(1X90 + 1x400 TPD)
12	Vacuum Degassing	Tonnes	1X30 T + 1X100 T
13	Ferro Alloy Plant (9MVA +18 MVA)		
a	Ferro Manganese OR	TPA	9 MVA= 18,000 18 MVA=36,000 Total = 54,000
b	Silico Manganese OR	TPA	9 MVA= 14,400 18 MVA=28,800 Total = 43,200
c	Ferro Chrome OR	TPA	9 MVA= 14,400 18 MVA=28,800 Total = 43,200
d	Ferro Silicon	TPA	9 MVA= 6,400 18 MVA=12,800 Total = 19,200
	Briquette Plant for ferro chrome	TPA	88,320
	Briquette Plant for ferro manganese	TPA	112,380
14	Sinter plant	TPA	2,101,572 (1x48 + 1x130 + 1x30 sq.m.)
15	Coke oven plant	TPA	910,000 (13 batteries x 70,000 TPA)
16	Producer gas plant	Nm ³ /hr	661,000 (17X30asf00 Nm3/hr+ 32X12500 Nm3/hr+28X 7500 Nm3/hr)
17	Cement Plant	TPA	2,805,000 (2x2500 + 2X1000 + 1X1500 TPD)

Now Rungta Mines Limited (Chaliyama Steel Plant) proposes the expansion as given in **Table 2**.

TABLE 2: EXISTING & PROPOSED PRODUCTION & CONFIGURATION OF ISP AT CHALIYAMA

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Additional proposed production and configuration	Total proposed production and configuration
(1)	(2)	(3)	(4)	(5)	(6) = (4)+(5)
	TOTAL PRODUCTION	MTPA	2.8805	4.138	7.0185
1	DRI Plant				
1.1	DRI (7X100 TPD kiln)	TPA	360,325	-	360,325
1.2	DRI (1X100 TPD kiln)	TPA	51,475	-	51,475
1.3	DRI (2X350 TPD kiln)	TPA	340,800	-	340,800

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Additional proposed production and configuration	Total proposed production and configuration
(1)	(2)	(3)	(4)	(5)	(6) = (4)+(5)
1.4	DRI (4 X 900 TPD)	TPA	1,725,300	-	1,725,300
1.5	DRI (4 X 900 TPD)	TPA	-	1,725,300	1,725,300
	Sub Total	TPA	2,477,900	1,725,300	4,203,200
2	Mini Blast Furnace				
2.1	MBF-1	TPA	696,920 (1x524 cum)	-	696,920 (1x524 cum)
2.2	MBF-2	TPA	853,125 (1 X 650 cum)	-	853,125 (1 X 650 cum)
2.3	MBF-3	TPA	-	864,500 (1 X 650 cum)	864,500 (1 X 650 cum)
2.4	MBF-4	TPA	-	864,500 (1 X 650 cum)	864,500 (1 X 650 cum)
2.5	BF	TPA	-	1,312,500 (1 X 1250 cum)	1,312,500 (1 X 1250 cum)
	Sub Total	TPA	1,550,045	3,041,500	4,591,545
3.0	SMS				
3.1	SMS (I) via IF Route	TPA	346,500 (IF 4x15 T, LRF 3x20 T)	-	346,500 (IF 4x15 T, LRF 3x20 T)
3.2	SMS (II) via IF Route	TPA	346,500 (IF 4x15 T, LRF 2x35T)	-	346,500 (IF 4x15 T, LRF 2x35T)
3.3	SMS (III) via IF Route	TPA	346,500 (IF 4X15T, LRF 2X35 T)	-	346,500 (IF 4X15T, LRF 2X35 T)
3.4	SMS (IV) via IF Route	TPA	1,001,000 (IF 13X20T, LRF 4X45T)	-	1,001,000 (IF 13X20T, LRF 4X45T)
3.5	SMS (V) EAF/ BOF/ EOF Route	TPA	840,000 (EAF/ EOF 1x100T or BOF 1x75T or AOD 1x100T)	-	840,000 (EAF/ EOF 1x100T or BOF 1x75T or AOD 1x100T)
3.6	SMS (VI) via IF Route	TPA	-	1,120,000 (IF 20X20T, LRF 8x45 T)	1,120,000 (IF 20X20T, LRF 8x45 T)
3.7	SMS (VII) via BOF NOF /EOF/EAF-LF-VD/RH/AOD	TPA	-	1,287,000 (2x65 T, LRF 2x65 T)	1,287,000 (2x65 T, LRF 2x65 T)
3.8	SMS (VIII) via BOF /EOF/EAF-LF-VD/RH/AOD	TPA	-	891,000 (2x45T, LRF 2x45 T)	891,000 (2x45T, LRF 2x45 T)
3.9	SMS (IX) via BOF /EOF/EAF-LF-	TPA	-	840,000 (1x75 T, LRF 1x75T)	840,000 (1x75 T, LRF 1x75T)

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Additional proposed production and configuration	Total proposed production and configuration
(1)	(2)	(3)	(4)	(5)	(6) = (4)+(5)
	VD/RH/AOD				
		Total	2,880,500	4,138,000	7,018,500
4	Billets/slab/bloom caster				
4.1	Billet caster (I)	TPA	339,570	-	339,570
4.2	Billets caster (II)	TPA	339,570	-	339,570
4.3	Billets caster (III)	TPA	339,570	-	339,570
4.4	Billets caster (IV)	TPA	980,980	-	980,980
4.4	Billets caster (V)	TPA	823,200	-	823,200
4.5	Caster (VI)	TPA	-	1,108,800	1,108,800
4.6	Caster (VII)	TPA	-	1,274,130	1,274,130
4.7	Caster (VIII)	TPA	-	882,090	882,090
4.8	Caster (IX)	TPA	-	831,600	831,600
		Total	2,822,890	4,096,620	6,919,510
5	Continuous casting machine/TSCR		9x4 strand	7x4 strand	16x4 strand
6	Rolling mill (TMT/ flat/ Round/ wire rod/ structural mill/ others)				
6.1	Rolling mill (I)	TPA	325,988		
6.2	Rolling mill (II)	TPA	325,988		
6.3	Rolling mill (III)	TPA	325,988		
6.4	Rolling mill with Annealing & Pickling & Galvanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others)	TPA	1,550,000 (1X0.5 + 1X0.45 + 2X0.3 MTPA)	-	1,550,000 (1X0.5 + 1X0.45 + 2X0.3 MTPA)
6.5	Rolling mill with Pickling & Galvanizing line (strip mill / sheet / coil/wire rod/structural / others)	TPA	200,000	-	200,000
6.6	Ductile Pipe Plant	TPA	500,000 (1X0.2 + 1X 0.3 MTPA)	-	500,000 (1X0.2 + 1X 0.3 MTPA)
6.7	Rolling Mill (Long/TMT/ Flat/Strip/ Round/ Wire Rod/Hot Rolled/HRC/ /Structural Mill/Plate/ Pipe& Tube Products /wire drawing etc)	TPA	-	2,740,000 (2 X 0.55 MTPA+2X0.42 MTPA+1X0.8MTPA)	2,740,000 (2 X 0.55 MTPA+2X0.42 MTPA+1X0.8MTPA)
6.8	Rolling Mill	TPA	-	1,200,000	1,200,000

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Additional proposed production and configuration	Total proposed production and configuration
(1)	(2)	(3)	(4)	(5)	(6) = (4)+(5)
	(Long/TMT/ Flat/Strip/ Round/ Wire Rod/Hot Rolled/HRC/ Structural Mill/ /Tin Plate/ Electrical Steel CRGO/Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold rolling, annealing, galvanizing and colour coating				
		Total	3,227,964	3,940,000	7,167,964
7	Captive Power Plant	MW	657	595	1252
7.1	WHRB	MW	229	Existing revised to 264 Additional 310	574
7.2	AFBC/ CFBC	MW	420	230	650
7.3	TRT	MW	8	20	28
7.4	TG	MW	5x20 + 2x40 + 9x25 + 2x65 + 1x70 + 2x30	4x65 + 5x60 + 1x35	5x20 + 2x40 + 9x25 + 6x65 + 1x70 + 2x30 + 5x60 + 1x35
8	Pelletisation plant	TPA	25,000,000 (5 X 3 MTPA+10 X 1 MTPA)	-	25,000,000 (5 X 3 MTPA+10 X 1 MTPA)
9	Coal washery	TPA	1,260,000	-	1,260,000
10	Oxygen	cum/annum	161,700,000 (1X100 + 2X150 + 1x200 TPD)	588,000,000 (2x600 TPD+1x1200 TPD)	749,700,000 (1X100 + 2X150 + 1x200 TPD + 2x600 +1200 TPD)
11	Lime Plant	TPA	171,500 (1X90 + 1x400 TPD)	462,000 (1x600 +2x400 TPD)	633,500 (1x90 T+3x400 +1x600 TPD)
12	Vacuum Degassing	Tonnes	1X30 T + 1X100 T	-	1X30 T + 1X100 T
12.1	RH/VD/AOD	Tonnes	-	2x65 T + 1x75 T + 2x45 T	2x65 T + 1x75 T + 2x45 T
13	Ferro Alloy Plant (9MVA +18 MVA)				
a	Ferro Manganese OR	TPA	9 MVA= 18,000 18 MVA=36,000 Total = 54,000	-	9 MVA= 18,000 18 MVA=36,000 Total = 54,000
b	Silico Manganese OR	TPA	9 MVA= 14,400 18 MVA=28,800	-	9 MVA= 14,400 18 MVA=28,800

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Additional proposed production and configuration	Total proposed production and configuration
(1)	(2)	(3)	(4)	(5)	(6) = (4)+(5)
			Total = 43,200		Total = 43,200
	c Ferro Chrome OR	TPA	9 MVA= 14,400 18 MVA=28,800 Total = 43,200	-	9 MVA= 14,400 18 MVA=28,800 Total = 43,200
	d Ferro Silicon	TPA	9 MVA= 6,400 18 MVA=12,800 Total = 19,200	-	9 MVA= 6,400 18 MVA=12,800 Total = 19,200
	Briquette Plant for ferro chrome	TPA	88,320	-	88,320
	Briquette Plant for ferro manganese	TPA	112,380	-	112,380
14	Sinter plant	TPA	2,101,572 (1x48 sq.m. + 1x130 sq.m. + 1x30 sq.m.)	4,653,000 (2x130 sq.m +1x210 sq.m)	6,754,572 (1x48 sq.m. + 1x 30 sq.m. + 3x130 sq.m +1x210 sq.m)
15	Coke oven plant	TPA	910,000 (13 batteries x 70,000 TPA)	1,680,000 (2 batteries x 420,000 TPA + 12 batteries x 70,000 TPA)	2,590,000 (2 batteries x 420,000 TPA + 25 batteries x 70,000 TPA)
16	Producer gas plant	Nm ³ /hr	661,000 (17X3000 Nm ³ /hr+ 32X12500 Nm ³ /hr+28X 7500 Nm ³ /hr)	-	661,000 (17X3000 Nm ³ /hr+ 32X12500 Nm ³ /hr+28X 7500 Nm ³ /hr)
17	Cement Plant	TPA	2,805,000 (2x2500 + 2X1000 + 1X1500 TPD)	1,552,500 3x1500 TPD	4,357,500 (2x2500 + 2X1000 + 4X1500 TPD)

2.2 Brief description of nature of the project

The nature of the project as per **Schedule to EIA Notification, 2006 & its amendments** is Item no. 3(a) for metallurgical industries (ferrous & non - ferrous). This is a Category A project. The various sub-projects fall in the following categories:

Sub-Project	Item No.	Category
Pellet Plant	2(b)	A
DRI, MBF, SMS, Ferro Alloy Plant	3(a)	A
Coal washery	2(a)	A

Sub-Project	Item No.	Category
Coke oven plant	4(b)	A
Captive Power Plant	1(d)	A
Cement Plant	3(b)	A

2.3 Need for the project and its importance to the country and or region

As per the National Steel Policy, the objective is to build a globally competitive industry. It is anticipated that a crude steel capacity of 300 Million Tonnes will be required by 2030 based upon the demand projections.

Thus, achieving crude steel capacity of upto 300 Million Tonnes will require extensive mobilization of natural resources, finances, manpower and infrastructure including land.

The proposed expansion of the existing steel plant will assist in our endeavour to meet the projected demand of steel in the country.

2.4 Demand-supply gap

This projection shows that there is good scope for creation of additional capacities for value added wire rods, i.e. Wire Rods in Medium Carbon, High Carbon and Alloy Steel Grades.

Production & National Steel Policy 2017

- The Indian steel industry has entered into a new development stage, post de-regulation, riding high on the resurgent economy and rising demand for steel.
- Rapid rise in production has resulted in India becoming the 3rd largest producer of crude steel in 2015 as well as in 2016. The country was the largest producer of sponge iron or DRI in the world during the period 2003-2015 and emerged as the 2nd largest global producer of DRI in 2016 (after Iran). India is also the 3rd largest finished steel consumer in the world and maintained this status in 2016. Such rankings are based on provisional data released by the World Steel Association for the above year.
- In a de-regulated, liberalized economic/ market scenario like India, the Government's role is that of a facilitator which lays down the policy guidelines and establishes the institutional mechanism/ structure for creating conducive environment for improving efficiency and performance of the steel sector.
- In this role, the Government has released the National Steel Policy 2017, which has laid down the broad road map for encouraging long

term growth for the Indian steel industry, both on demand and supply sides, by 2030-31.

- The Government has also announced a policy for providing preference to domestically manufactured Iron & Steel products in Government procurement. This policy seeks to accomplish PM's vision of 'Make in India' with objective of nation building and encourage domestic manufacturing and is applicable on all government tenders where price bid is yet to be opened. Further, the Policy provides a minimum value addition of 15% in notified steel products which are covered under preferential procurement. In order to provide flexibility, Ministry of Steel may review specified steel products and the minimum value addition criterion.

TMT Rebars and Wire Rods are global commodities. Depending on urgent requirement and price difference in different countries, imports and exports do take place regularly. Import figures are published by Joint Plant Committee (JPC).

As per the latest publication (April 2019) available from JPC, import data for Bars & Rods for April 2018 to March 2019 is given in **Table 3**.

TABLE 3: IMPORT DATA FOR BARS & RODS

Sl. No.	Description	Gross Production (tonnes)	Imports (tonnes)
1.	Bars & Wire Rods MS Grade	38,057,000	349,000
2.	Non-Flat Products, i.e., Wire Rods, Plain Bars etc. Value Added Grades	7,338,000	591,000
	Total	45,395,000	940,000

Source: Pre-feasibility report, October 2019 by KORUS Engineering Solutions Pvt. Ltd.

- The above figures show that imports are small quantity for MS Grade but substantial for Value Added Grades.
- Imports are not expected to impose a significant threat to domestic players in future. There is no proposal.

2.5 Export possibility

Export possibilities do exist. Some quantities are always being exported. These figures are also published regularly by JPC. As per the latest publication (April 2019) available from JPC, Export data for Bars & Rods for April 2018 to March 2019 is given in **Table 4**.

TABLE 4: EXPORT DATA FOR BARS & RODS

Sl. No.	Description	Gross Production (tonnes)	Export (tonnes)
1.	Bars & Wire Rods MS Grade	38,057,000	509,000
2.	Non-Flat Products Value Added Grades	7,338,000	277,000
	Total	45,395,000	786,000

Source: *Pre-feasibility report, October 2019 by KORUS Engineering Solutions Pvt. Ltd.*

2.6 Domestic / Export markets

The steel shall be sold in domestic market or exported.

2.7 Employment generation (Direct and Indirect)

The total existing manpower is 5530 and an equal number in indirect employment. The additional manpower required will be 1800. The total manpower after the expansion of the project will be 7330. Many more persons will also get employment in the ancillary & other services connected with this project.

3.0 PROJECT DESCRIPTION

3.1 Type of project including interlinked and interdependent projects

There is no interlinked or interdependent project.

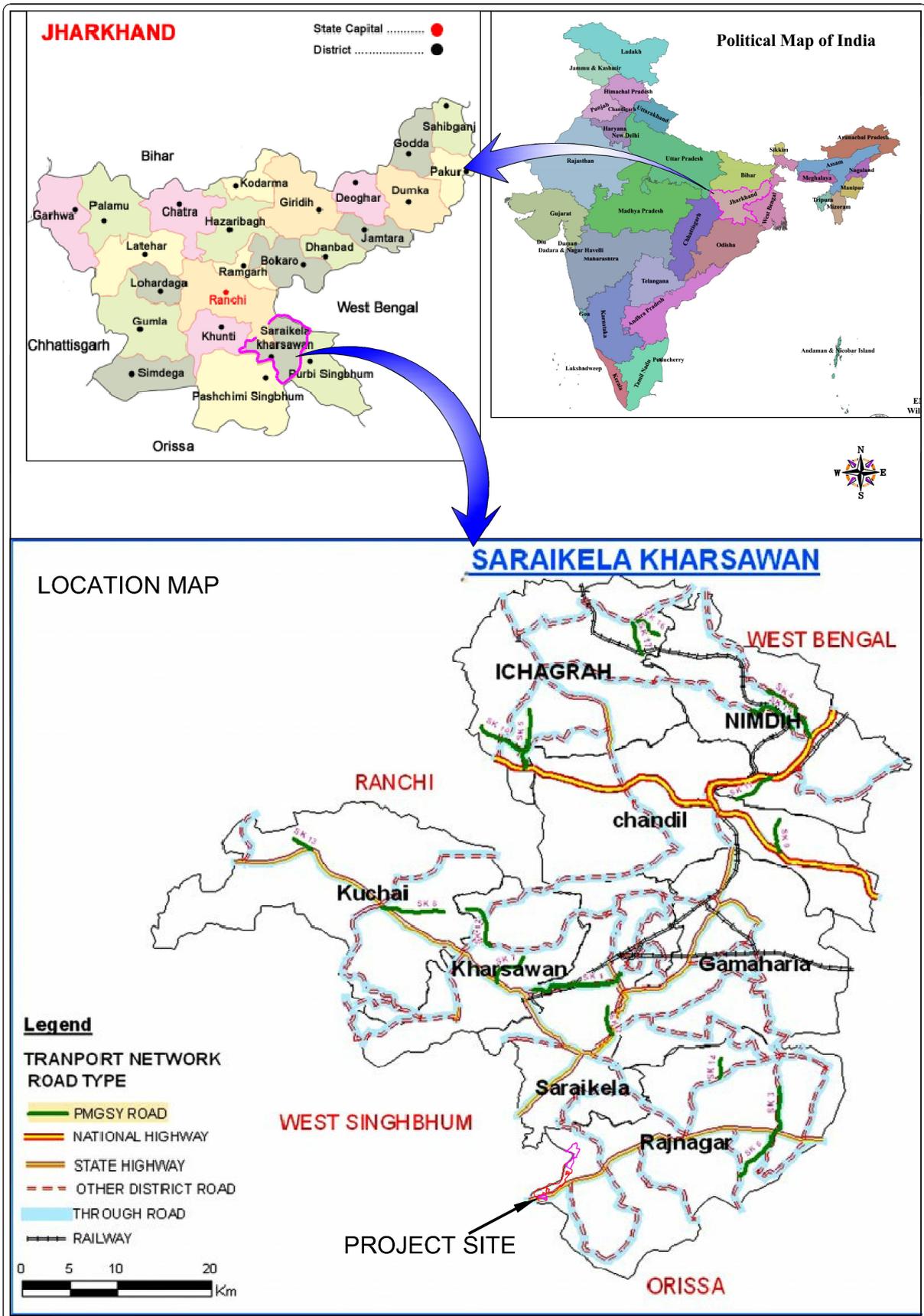
3.2 Location with Coordinates

The project is located in Villages Chaliyama, Bankasai, Kuju, Arahasa and Medki, Tehsil Rajnagar, District Saraikela- Kharsawan, State Jharkhand. The coordinates of the plant area and raw material storage and plant area based on Google Earth as on 12.07.2021 are:

Point	Project Area	
	Latitude	Longitude
South most	22° 33' 22.03"	85° 52' 54.62'
North most	22° 37' 50.06"	85° 54' 58.19'
East most	22° 36' 42.26"	85° 55' 14.12'
West most	22° 33' 52.31"	85° 52' 22.60'

Location map showing general location, specific location and project boundary is given in **Fig 1**.

FIG 1: LOCATION MAP



3.3 Details of Alternate Sites & Environmental Considerations

No alternatives are under consideration. The expansion project will be implemented in an adjoining area of 449.09 acres of land to the existing plant area of 933.44 acres.

Environmental considerations: There are no National parks, Wildlife Sanctuary, Biospheres reserves within 15 km radius. The nearest Wildlife Sanctuary is Dalma Sanctuary at a distance of 33 km in NE. The nearest National Park is Simlipal National park at a distance of 66 km in SE direction and its ESZ zone is at a distance of 51 km in SE. There are several water bodies and forest present within the study area of the project. The distance to various water bodies, forest, etc. are given in **Table 5**.

TABLE 5: DISTANCE AND DIRECTION (WITHIN 15 KM) OF WATER BODIES & FORESTS FROM PROJECT BOUNDARY

Name	Distance (km)	Direction
Forests		
Chuka Pahar and Gidi Pahar PF	9.3	E
Tring PF	12.7	SE
Jerai PF	12.9	SE
Gobra Buru Pahar PF	5.2	ESE
Kokcho PF	9.4	S
PF near Sini Village	8.5	SSE
PF near Urangsahi village	8.3	S
PF near Angardia	14.5	S
Sahedba RF	12.2	W
PF near Kope	2.4	W
PF around Uparsila	0.2	E
PF near Dhanudih	4.6	E
PF near Banksai	0.09	SE
PF near Sahebganj	14.1	NNE
PF near Bhundu	13.6	N
PF near Baddil	14.1	NE
River / Nala/ stream		
Kharkai river	Adjoining	W
Roro Gara	1.1	W
Sona Nadi	7.3	ENE
Sona nala	9.2	ENE
Lor Gara nala	Within	
Illi Gara	4.5	S
Hon Gara	5.1	S

Name	Distance (km)	Direction
Chirchi nala	9.1	SE
Bengra nala	10.7	SE
Gumua Gara	10.3	WSW
Garra Nadi	11.4	ENE
Sanjar Nala	12.7	NE
Sanjay Nadi	13.9	NW
Kuchai Nala	14.6	NNW
Siyaljora Nala	14.1	NNW
Icha left main Canal-1	1.4	SE
Icha left main Canal -2	2.1	W
Canal Near Kamarbasa	1.2	E
Dam near Icha	0.6	SE
Reservoir near Sankohatu	8.3	W
Reservoir near Jonkosasan	10.3	NNW
Reservoir Near Bara Mauni	1.5	S
Reservoir near Kashidih	3.8	E
Water Body		
Pond near Sen tota Chaibasa	6.8	WSW
Pond near Amla tola, Chaibasa	6.2	SE
Pond near Phuljhari village	12.6	SE
Pond near Rajnagar	9.5	ENE
Pond near Saraikela	8.6	N
Pond near Saldih	11.0	N
Pond near Sidadih	3.3	NNE
Pond near Tantidih	13.9	ENE
Pond near Manikbazar	11.1	NNE
Pond near Gaurangdih	13.4	NNE
Pond near Rangadih	12.8	N
Pond near Bagusaring	14.1	WNW
Pond near Tholko	5.6	NW
Pond near Gangidih	0.4	N
Pond near Sona Gobra	12.0	SE
Pond near Jamdih	7.3	E
Pond near Ramchandrapur	13.1	NE
Pond near Laxmiposhi	10.2	NE
Pond in Medki	Adjoining	
Pond in Arahasa village	0.3	E

3.4 Size/ Magnitude of operation

Existing and proposed manufacturing facilities and production are given **Table 2**. Implementation status of the existing EC is given in **Table 6**.

TABLE 6: IMPLEMENTATION STATUS OF THE EXISTING EC

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Status as on 06.07.2021	Production as per CTO
1	DRI Plant				
1.1	DRI (7X100 TPD kiln)	TPA	360,325	Operational	360,325
1.2	DRI (1X100 TPD kiln)	TPA	51,475	Operational	51,475
1.3	DRI (2X350 TPD kiln)	TPA	340,800	Operational	340,800
1.4	DRI (4 X 900 TPD)	TPA	1,725,300	Yet to be installed	
	Sub Total	TPA	2,477,900		752,600
2	Mini Blast Furnace				
2.1	MBF-1	TPA	696,920 (1x524 cum)	Order placed	
2.2	MBF-2	TPA	853,125 (1 X 650 cum)	Yet to be installed	
	Sub Total	TPA	1,550,045		
3.0	SMS				
3.1	SMS (I) via IF Route	TPA	346,500 (IF 4x15 T, LRF 3x20 T)	Operational (IF 4x15 T and 2x20 T LRF)	346,500
3.2	SMS (II) via IF Route	TPA	346,500 (IF 4x15 T, LRF 2x35T)	Operational (IF 4x15T and 2x35 T LRF)	346,500
3.3	SMS (III) via IF Route	TPA	346,500 (IF 4X15T, LRF 2X35 T)	Under construction	
3.4	SMS (IV) via IF Route	TPA	1,001,000 (IF 13X20T, LRF 4X45T)	Yet to be installed	
3.5	SMS (V) EAF/ BOF EOF Rout-1	TPA	840,000 (EAF/ EOF 1x100T or BOF 1x75T or AOD 1x100T)	Yet to be installed	
		Total	2,880,500		693,000
4	Billets/slab/bloom caster				
4.1	Billet caster (I)	TPA	339,570	Operational	339,570
4.2	Billets caster (II)	TPA	339,570	operational	339,570
4.3	Billets caster (III)	TPA	339,570	Under construction	
4.4	Billets caster (IV)	TPA	980,980	Yet to be installed	
4.4	Billets caster (V)	TPA	823,200	Yet to be installed	
		Total	2,822,890		679,140
5	Continuous casting machine		9x4 strand	Operational (2x3 strand) (1x4 strand under construction)	2x3 strand
6	Rolling mill (TMT/ flat/ Round/ wire rod/ structural mill/ others)				
6.1	Rolling mill (I)	TPA	325,988	Under operation	325,988
6.2	Rolling mill (II)	TPA	325,988	Under operation	325,988
6.3	Rolling mill (III)	TPA	325,988	Under construction	
6.4	Rolling mill with Annealing &	TPA	1,550,000	Yet to be installed	

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Status as on 06.07.2021	Production as per CTO
	Pickling & Galvanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others)		(1X0.5 + 1X0.45 + 2X0.3 MTPA)		
6.5	Rolling mill with Pickling & Galvanizing line (strip mill / sheet / coil/wire rod/structural / others)	TPA	200,000	Yet to be installed	
6.6	Ductile Pipe Plant	TPA	500,000 (1X0.2 + 1X 0.3 MTPA)	Order placed	
		Total	3,227,964		651,976
7	Captive Power Plant	MW	657	Operational and 80 MW is under construction	58 MW (33 MW WHTB and 25 MW AFBC)
7.1	WHRB	MW	229	Operational	33 MW
7.2	AFBC/ CFBC	MW	420	Operational and 80 MW CFBC based under construction	25 MW
7.3	TRT	MW	8		
7.4	TG	MW	5x20+2x40+9x25+2x65+1x70+2x30	Under operation and 2x40 MW is under construction	3x20 MW
8	Pelletisation plant	TPA	25,000,000 (5 X 3 MTPA+10 X 1 MTPA)	3,000,000 TPA under construction	
9	Coal washery	TPA	1,260,000	Yet to installed	
10	Oxygen	cum/annum	161,700,000 (1X100 + 2X150 + 1x200 TPD)	Order placed 200 TPD	
11	Lime Plant	TPA	171,500 (1X90 + 1x400 TPD)	Yet to installed	
12	Vacuum Degassing	Tonnes	1X30 T + 1X100 T	Yet to installed	
13	Ferro Alloy Plant (9MVA +18 MVA)				
a	Ferro Manganese OR	TPA	9 MVA= 18,000 18 MVA=36,000 Total = 54,000	Yet to installed	
b	Silico Manganese OR	TPA	9 MVA= 14,400 18 MVA=28,800 Total = 43,200	Yet to installed	
c	Ferro Chrome OR	TPA	9 MVA= 14,400 18 MVA=28,800 Total = 43,200	Yet to installed	
d	Ferro Silicon	TPA	9 MVA= 6,400 18 MVA=12,800 Total = 19,200	Yet to installed	
	Briquette Plant for ferro chrome	TPA	88,320	Yet to installed	
	Briquette Plant for ferro manganese	TPA	112,380	Yet to installed	
14	Sinter plant	TPA	2,101,572	Order placed 1x30	

Sl. No.	Facilities	Units	Present Sanctioned production & configuration as per EC dated 19.01.2021	Status as on 06.07.2021	Production as per CTO
			(1x48 + 1x130 + 1x30 sq.m.)	+ 48 sq.m.	
15	Coke oven plant	TPA	910,000 (13 batteries x 70,000 TPA)	Yet to be installed	
16	Producer gas plant	Nm ³ /hr	661,000 (17X30asf00 Nm3/hr+ 32X12500 Nm3/hr+28X 7500 Nm3/hr)	Yet to be installed	
17	Cement Plant	TPA	2,805,000 (2x2500 + 2X1000 + 1X1500 TPD)	Yet to be installed	

3.5 Project description with process details

Expansion of Chaliyama Steel Plant from 2.8805 MTPA to 7.0185 MTPA crude steel capacity by adopting DRI-IF/EAF-LF-VD/ BOF/ NOF/ EOF/ EAF/ RH/ AOD Route followed by casting & rolling (including annealing, pickling, galvanising, colouring) with installation of additional 595 MW CPP in Chaliyama Steel plant at villages Chaliyama, Bankasai, Kuju Arahasa and Medki, District Saraikela – Kharsawan, Jharkhand.

Manufacturing process for each individual production unit is described in subsequent sections.

3.5.1 Pelletisation Plant (25,000,000 TPA)

This is a unit already sanctioned in the EC dated 09.01.2021. Its capacity is 25 MTPA and will produce iron oxide pellets suitable for use in DRI and Blast Furnace. No expansion has been proposed. The configuration of the pellet plant is given in **Table 7**.

TABLE 7: CONFIGURATION OF PELLETISATION PLANT

Description	Total
Configurations	5 nos. X 3 MTPA + 10 nos. X 1 MTPA
Number of days per year	330-345
No. of working hours/day	24
Total Capacity (Based on output)	25,000,000 TPA

Process Description

The pellet plant will produce oxide pellets suitable for use in DRI kiln and blast furnace. Pellets are heat hardened balls produced from concentrates and natural iron ores of different mineralogical and chemical composition. The pellets have improved properties for iron making. Pelletization process involves feed preparation, green ball formation, pellet induration and product dispatch.

Steps involved in pelletisation process are as follows:

- Lime stone is ground together with coke breeze in a ball mill. A hot gas generator using fuel oil is attached to the ball mill to dry the additives. The ground coke/ limestone mix is sent to the day bins in the mixing area.
- Bentonite is ground in a roller mill separately. It is equipped with a hot gas generator for the simultaneous drying of the ground product, bag filter and fan. Ground products are stored in silos and transported pneumatically to bin/ mixing building.
- Iron ore is collected on a belt conveyor and fed into filter cake bin.
- Pre-weighed portions of filter cake, coke breeze/ limestone mix and bentonite are mixed in mixer, enabling intensive mixing of above materials.
- The above mixture is conveyed to a bin directly above pelletizing discs
- The green ball formation is done through disc pelletizers
- The green balls are fed to an indurating machine wherein pellets are produced. Green balls (green pellets) will be indurated on a traveling grate which consists of an endless chain of pellet cars moving on tracks.
- To avoid thermal shocks to grate bars, green pellets are charged over a layer of indurated pellets, called 'hearth layer'. Pellet sidewalls (both sided) are also protected from excessive heat, with indurated pellets called 'side layers'.
- A storage bin for hearth and side layers having three outlet chutes is provided at the feed end of the travelling grate. First, hearth layer is fed onto the indurating machine followed by simultaneous feeding of side layers (both sides) and green balls into the process of induration.
- The indurated and cooled pellets are discharged from the indurating machine on to a product conveyor through a product discharge bin.
- This belt conveyor discharges product pellets into a hearth layer separation bin, having two outlets. From one bottom outlet, the amount of pellets required as hearth & side layer are discharged, controlled by the level of hearth layer bin mentioned above. Hearth layer shall be transported by a series of belt conveyors to hearth layer bin while product pellets are discharged for transportation to the pellet stock pile.

Material balance of the pelletisation plant is given in **Table 8**. Process flow sheet is given in **Fig 2**.

TABLE 8: MATERIAL BALANCE OF 25 MTPA PELLETTISATION PLANT

Raw Material & Fuel Inputs	% of charge	Quantity (TPA)	Specific Consumption (T/T)
Iron Ore/ Fines/ concentrate/ dust	93.18%	28,000,000	1.120
Dolomite (Flux)	2.06%	625,000	0.025
Bentonite	0.82%	250,000	0.010
Coke Breeze	1.65%	500,000	0.020
Coal	3.29%	1,000,000	0.040
Total	100	30,375,000	1.215
Outputs		Quantity (TPA)	Specific Generation (T/T)
Pellets	85.01%	25,000,000	1.000
Dust	6.94%	600,900	0.024
Losses	8.05%	4,774,100	0.191
Total	100%	30,375,000	1.215

The fuel in the under construction 3 MTPA pellet plant will be furnace oil or low sulphur diesel till the time the producer gas plant becomes operation. The 10 nos. X 1 MTPA pellet plants proposed to be established in future will be operated on producer gas. The producer gas consumption will be to the tune of 661,000 NM³/hr.

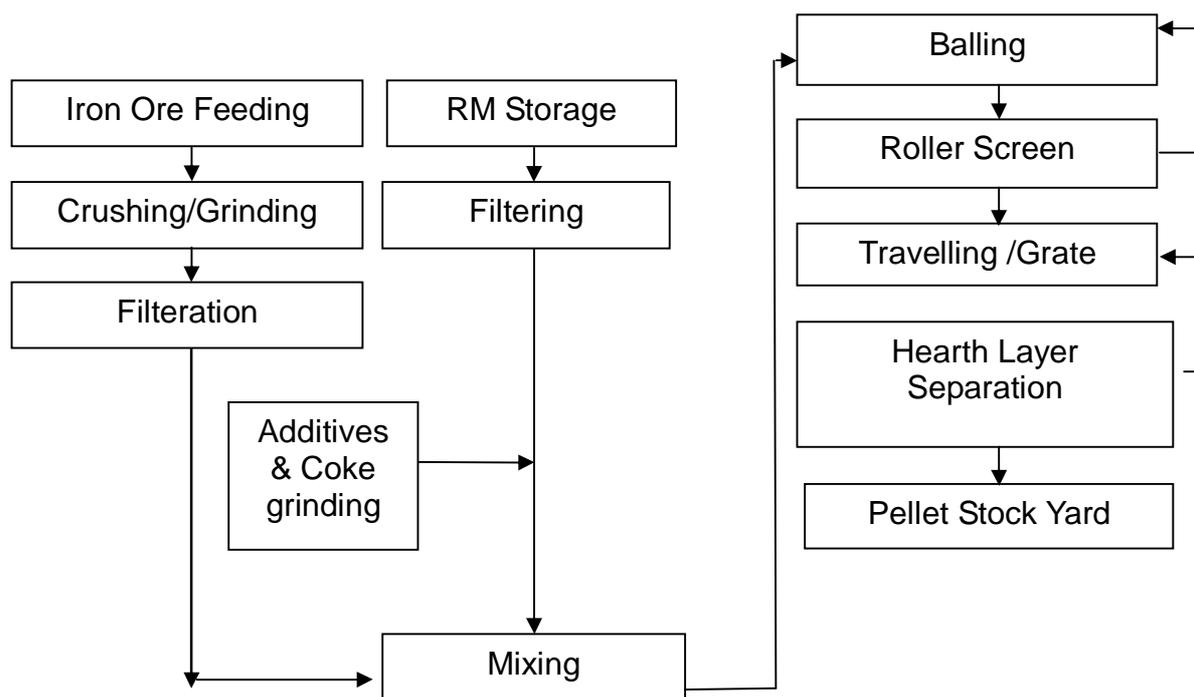
Quality of pellets DR Grade

The expected chemical composition of DR/BF grade pellets and their chemical, physical & metallurgical properties are given in **Table 9**. The properties of the finished pellets will vary depending on actual physical and chemical characteristics of input raw materials.

TABLE 9: CHEMICAL, PHYSICAL & METALLURGICAL PROPERTIES OF DR PELLETS

Chemical Properties	Specification	Chemical Properties	Specification
Fe (t)	66.50% min	Mn	0.10% max
SiO ₂ + Al ₂ O ₃	3.10% max	P	0.04% max
Na ₂ O	0.05% max	S	0.02% max
K ₂ O	0.05% max	V	----
TiO ₂	0.10% max	Basicity (CaO/SiO ₂)	0.5
		Moisture (free moisture loss at 105 degree centigrade)	4% max (fair season), 6% max (monsoon)
Metallurgical Properties	Specification	Physical Properties	Specification
Swelling (JIS)	20% max	+19mm	5% max
Compression strength	250 kg/pellet min	-16 mm, +9mm	85% max
Porosity	18-25% min	-9mm, +5mm	5% min
Reducibility (JIS)	70% min	-5mm	3% max
		Tumbler test (ASTM)	
		Tumble Index (+6.35mm)	94% min

Source:- IS : 11092-2001

FIG 2: PROCESS FLOW OF PELLETISATION PROCESS

3.5.2 Coal washery (1,260,000 TPA)

The EC has been obtained for 1.26 MTPA coal washery and no change has been proposed. The material balance of the washery is given in **Table 10**.

TABLE 10: MATERIAL BALANCE OF 1.26 MTPA WASHERY

Inputs	Quantity	Specific consumption (T/T)
ROM coal to be fed to the washery	1.26 MTPA	1.0
Outputs		Specific generation (T/T)
Washed coal	0.63 MTPA	0.5
Middlings expected	0.535 MTPA	0.425
Rejects	0.095 MTPA	0.075

Process Description

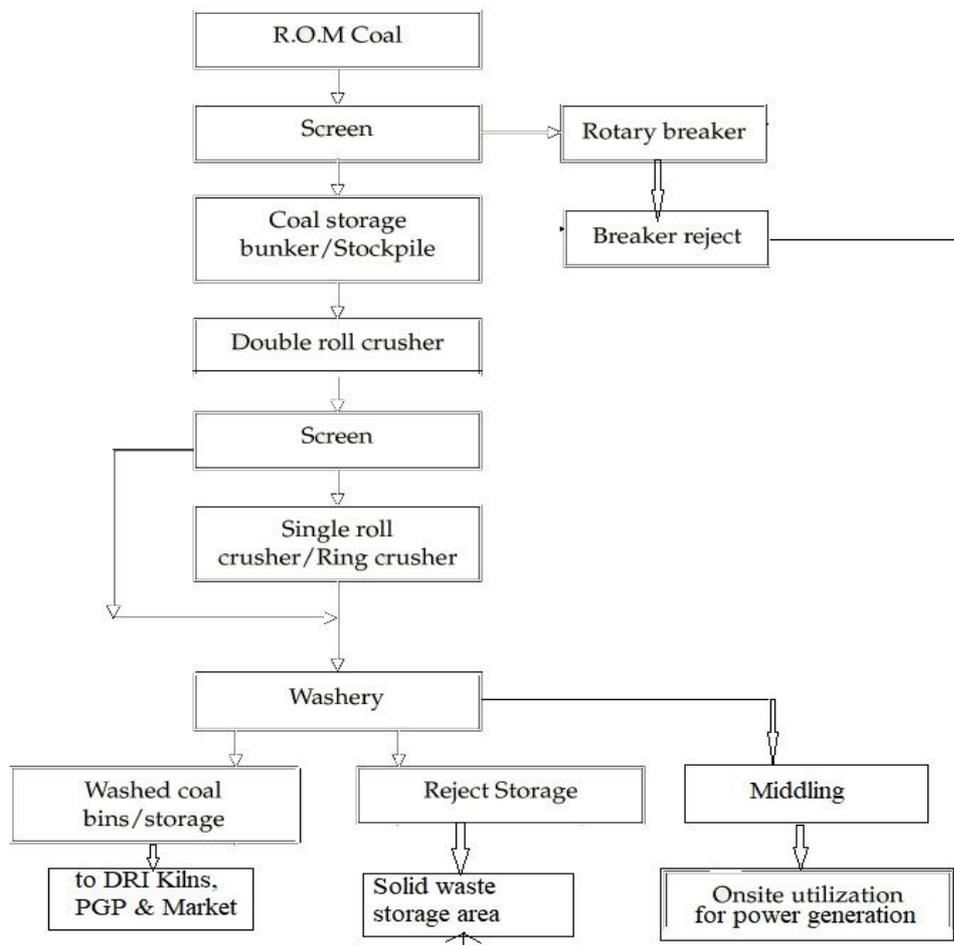
Beneficiation consists of cleaning of raw coal by separation of mineral matter (ash) from the coal. The cleaning of coal is mainly based on separation of the impurities by physico-chemical methods based on the differences in the specific gravity of coal constituents and on the differences in surface properties of the coal and its mineral matter required. The cleaning process that will be followed will be the wet process, where water is the main medium for washing and jigging. The washery will include:

- Primary crushing- to receive ROM coal and reduce it to a top size of 2-8”.
- Scalping screen – for separating refuse and fines prior to size reduction.

- Raw coal sizing screen- for separating the raw coal into coarse and fine size for further processing.
- Pre-wet screen- to remove fines prior to the mechanical cleaning.
- Secondary crushing-to reduce the size (to a top size of 1 ¾”) of the middling fraction from jigs or the middling fraction from heavy – medium trough separators, and, in turn these fractions would be rewashed.
- Desliming screens-to remove extreme fines; and
- Dewatering screens-to remove water.

The process flow sheet of washery is given in **Fig 3**.

FIG 3: COAL WASHERY PROCESS



3.5.3 DRI Plant (2,477,900 to 4,203,200 TPA)

Existing: The project has obtained EC for 8X100 TPD, 2X350 TPD and 4X900 TPD DRI units for the production of 2,477,900 TPA. Of this 8X100

TPD and 2X350 TPD is already in operation at Chaliyama Steel Plant while 4X900 TPD is yet to be installed.

Proposed: An additional 4X900 TPD DRI unit is proposed for the production of 1,725,300 TPA.

The existing and proposed configuration and capacity is given in **Table 11**.

TABLE 11: CONFIGURATION OF DRI PLANT

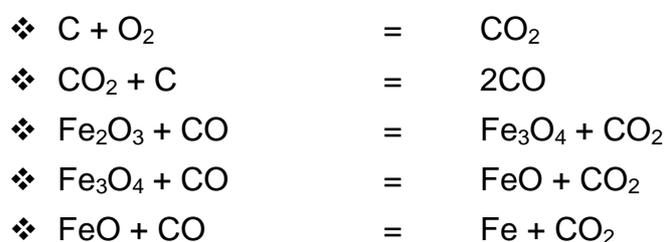
Description	Unit	Sanctioned capacity as per EC	Proposed Additional	Total
DRI Kilns nos. & capacity	Nos. X TPD	8X100 + 2x350 + 4x900	4x900	8X100 + 2x350 + 4x900 + 4x900
No. of working days	Days/ Annum	355	355	355
No. of working hours	Hours/ Day	24	24	24
Daily DRI production	TPD	6,980	4,860	11,840
Total Production	TPA	2,477,900	1,725,300	4,203,200

Process Description

Iron ore (lumps or pellets) is reduced by heating with solid carbonaceous material, such as coal, in a rotary kiln to temperature of about 1000°C. After reduction, products are cooled in a drum type rotary cooler and then separated into sponge iron and char by magnetic separation. The magnetic and non-magnetic material are stored in fully closed hoppers. The product house consists of silo for sponge iron lumps, sponge iron fines and char. The char shall be used as fuel in the proposed power plant.

High degree of reduction and thermal efficiency can be obtained by controlling process parameters such as reduction temperature, rate of feed, size of feed, grade of feed etc.

The basic reactions in this process are as given below:



Raw Material Handling System

Main raw materials- iron ore pellets, coal & dolomite are being fed to the ground hoppers with the help of pay loaders and tippers and carried by belt conveyors to the crusher house. Screened and crushed material will be

carried out by belt conveyers to the stock house, having 5 days storage bins. Crushers for coal & limestone, will be provisioned.

Raw Material Feed System

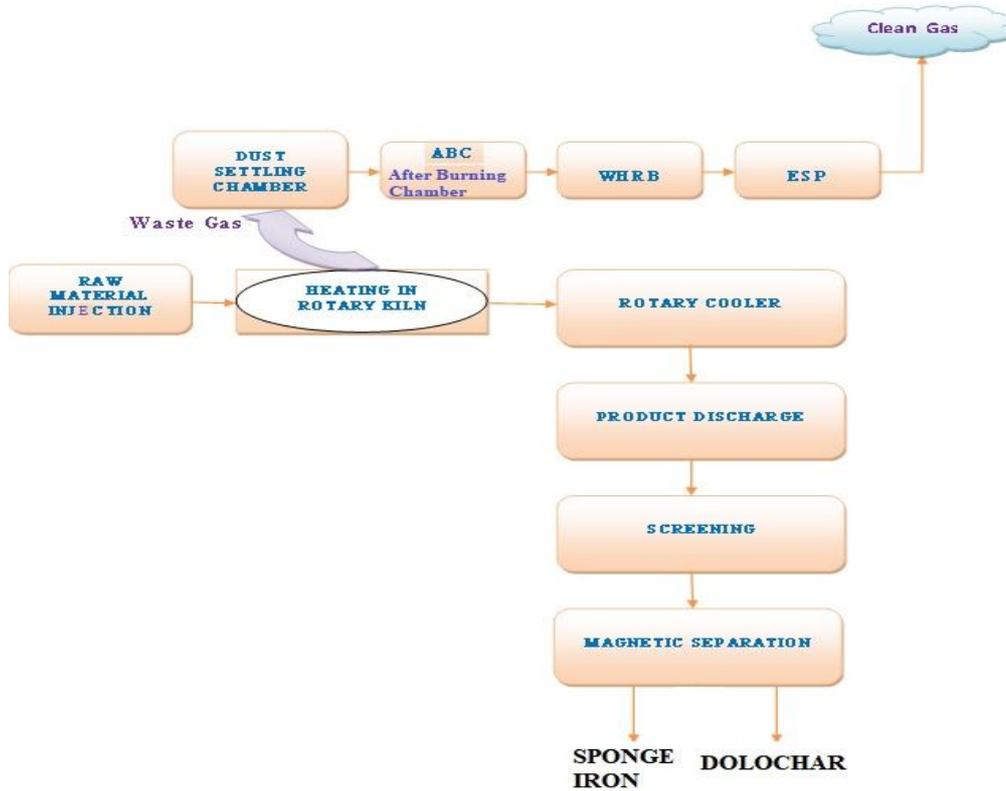
The stored raw material are weighed individually and fed to the kiln through a rotary airlock feeder. The injection coal system injects coal at the discharge end of rotary kiln to avoid coal starvation with 1 bar pressure at which leakages are not possible. There will be a burner system, which is used for initial heating of the kiln up to 400°C. The calibrated quantity of combustion air is also fed through the same opening. Proposed material balance is given in **Table 12**. Process flow sheet for DRI plant is shown in **Fig 4**.

TABLE 12: MATERIAL BALANCE OF DRI PLANT (EXISTING & PROPOSED)

	Sanctioned capacity as per EC dt. 19.01.2021		Proposed additional	Total production	
Raw Material Inputs	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
Iron Ore/Iron Oxide	3,776,490	1.52	2,629,476	6,405,966	1.52
Coal	2,289,750	0.92	1,594,296	3,884,046	0.92
Dolomite	116,369	0.05	81,025	197,394	0.05
Total	6,182,609	2.5	4,304,797	10,487,406	2.5
Outputs	Quantity (TPA)	Specific Generation (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Generation (T/T)
DRI	2,477,900	1	1,725,300	4,203,200	1.00
Char	524,668	0.21	365,313	889,981	0.21
ESP, Bag Filter Dust	194,000	0.08	135,077	329,077	0.08
Kiln accretion	49,225	0.02	34,274	83,499	0.02
Losses	2,936,817	1.19	2,044,832	4,981,649	1.19
Total	6,182,609	2.5	4,304,796	10,487,405	2.5

Process flow sheet for proposed DRI plant is shown in **Fig 4**.

FIG 4: PROCESS FLOW SHEET FOR PROPOSED DRI PLANT



3.5.4 Mini blast furnace/Blast Furnace (1,550,045 to 4,591,545 TPA)

Chaliyama Steel Plant has obtained an EC for 1x524 cum and 1x650 cum to produce 1,550,045 TPA. Additional units of 2x650 cum and 1x1250 cum is proposed to produce 3,041,500 TPA.

Configuration of existing and proposed blast furnace is given in **Table 13**.

TABLE 13: CONFIGURATION OF BLAST FURNACE

Description	Sanctioned capacity as per EC dt. 19.01.2021		Proposed additional		Total quantity
	Unit	Quantity	Quantity	Quantity	Quantity
MBF/BF	Nos.	2	2	1	5
Effective Volume	CUM	524 & 650	650	1250	524, 3X650, 1250
Utilisation coefficient	(T/ cum)	3.8	3.8	3.0	3.5
Working days	Days/ Annum	350	350	350	350
No. of working hours	Hours/ Day	24	24	24	24
Total Production	TPA	1,550,045	1,729,000	1,312,500	4,591,545

Material balance is given in **Table 14** & process flow sheet of the blast furnaces is given in **Fig 5**.

TABLE 14: MATERIAL BALANCE OF BLAST FURNACE (EXISTING & PROPOSED)

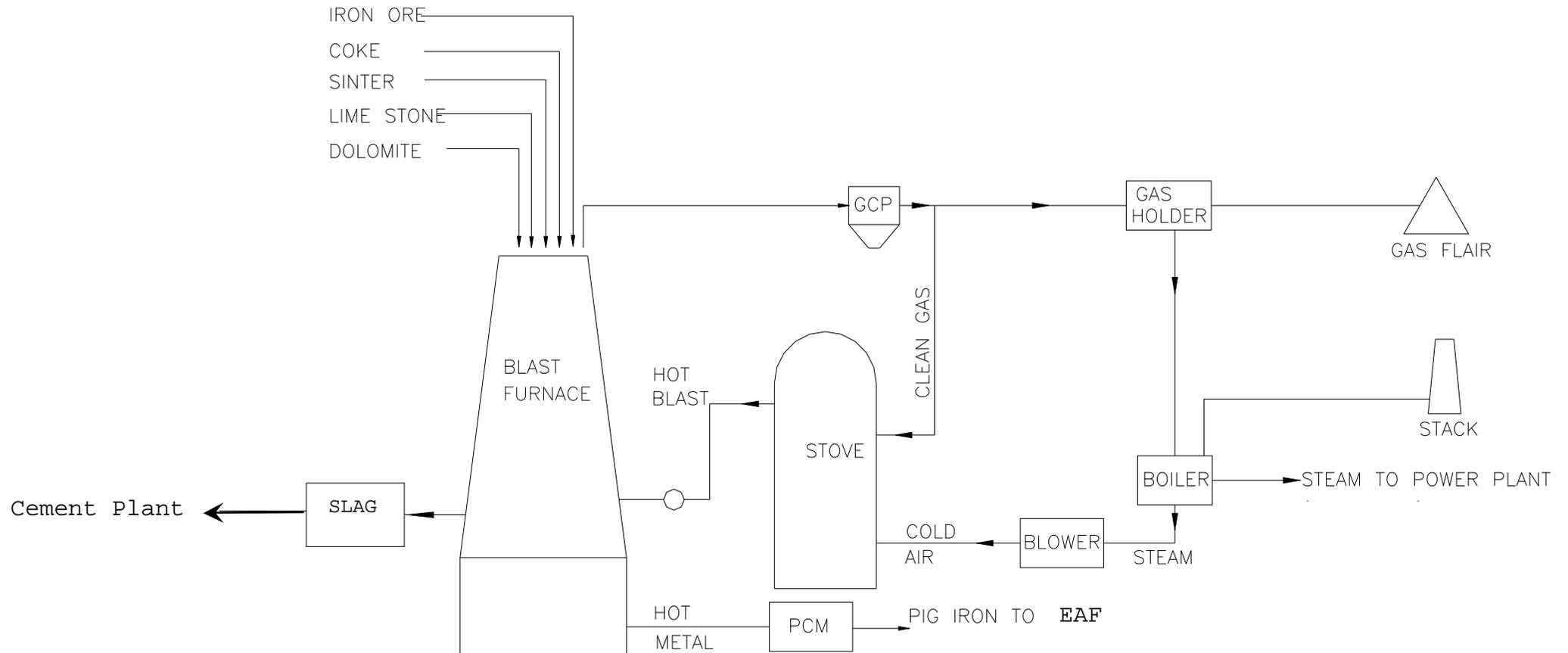
	Sanctioned capacity as per EC dt. 19.01.2021		Proposed Additional	Total	
	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
Iron Ore	297,281	0.19	219,336	516,617	0.11
Pellet	375,226	0.24	219,336	594,562	0.13
Sinter	1,981,907	1.28	4,653,000	6,634,907	1.45
Coke	766,295	0.49	1,162,350	1,928,645	0.42
Coal Dust	186,657	0.12	387,450	574,107	0.13
Dolomite	217,006	0.14	361,620	578,626	0.13
Quartz	79,685	0.05	134,316	214,001	0.05
Total	3,904,058	3	7,137,408	11,041,466	2
Outputs	Quantity (TPA)	Specific Generation (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Generation (T/T)
Hot Metal	1,550,045	1.00	3,041,500	4,591,545	1.00
BF Slag	451,259	0.29	912,450	1,363,709	0.30
GCP Dust	77,502	0.05	152,075	229,577	0.05
Losses in BF Gas	1,825,252	1.18	3,031,383	4,856,635	1.06
Total	3,904,058	3	7,137,408	11,041,466	2

Manufacturing Process and facilities

The purpose of a blast furnace is to chemically reduce and physically convert iron oxides into liquid iron called "hot metal". The blast furnace is a huge, steel furnace lined with refractory brick, where iron ore, coke and limestone are dumped into the top, and preheated air is blown into the bottom. The raw materials require 6 to 8 hours to descend to the bottom of the furnace where they become the final product of liquid iron and reject of liquid slag. Both of these are drained from the furnace at regular intervals.

The hot air that was blown into the bottom of the furnace ascends to the top in 6 to 8 seconds after going through numerous chemical reactions. The air is blown through tuyers in the bottom portion and liquid iron is tapped from the tap hole.

FIG 5: PROCESS FLOW SHEET OF MINI BLAST FURNACE



The blast furnace complex will consist of the requisite support facilities, namely the stock house, coal injection system, cast house, gas cleaning plant, de-dusting facilities, slag granulation unit, etc.

The blast furnace flue gas will be passed through Waste Heat Recovery Boiler and power generated from heat recovery. Thereafter, gas will be cleaned in dry Gas Cleaning Plant and utilized for stove of blast furnace. Unutilised gas shall be flared.

Stock House

The sized ore, fluxes, coke, etc., from the raw material storage yard, are transferred to the stock house and placed in respective bins by shuttle conveyors. The raw material will be screened before charging into the blast furnace. The stock house will be provided with a dedusting system (bag filters) for collection of dust arising from all material transfer points, vibratory feeder screens, weigh hoppers, etc.

Furnace

The blast furnace will be self-supporting free standing design complete with shell, refractory, cooling system, top charging equipment, bustle main, tuyeres/tuyere stocks etc. The blast furnace top equipment and the platform at various levels around the furnace are supported by an independent tower structure.

Hot Blast Stoves

The furnaces will be provided with stoves for supply of hot blast up to a maximum of 1100°C. The stoves will be of regenerative type and fired with blast furnace gas. Two fans, one working and one stand by will be provided for supply of combustion air to the stove burners. A chimney will be provided for the stoves. The different zones of the stoves will be lined with suitable quality of Alumina/Fireclay refractories depending on the temperature prevailing in the respective zones. The stove valves will be electrically/hydraulically actuated, and the stove-changing operations will be automatic and remotely controlled from the control room.

Cast House

The furnace will have one tap hole. A cast house will be provided for handling the tapping operations and the hot metal/ slag. The main hot metal trough will be fixed type fabricated steel construction. The hot metal runner from each trough will discharge the metal into hot metal ladle kept on cast house floor. For opening and closing of the tap-hole, a hydraulically operated mud gun and a pneumatically operated tap-hole drilling machine will be provided. The skimmed slag from the main trough will normally be led to the slag granulation trough. Under emergency conditions, the slag can also be diverted to the dry slag pit. The cast house will be served by an EOT crane in the hot metal bay, for transferring the filled up hot metal ladle

on to a ladle car for transfer to the steel melt shop. The crane will be used also for handling hot metal ladles to and from Pig Casting Machine (PCM) and ladle maintenance.

Slag granulation

The cast house will be served by a slag granulation unit. The slag / water slurry after granulation will be led to storage area and the water will be allowed to drain off. The granulated slag will be reclaimed by a pay loader and sent to the storage yard. From the storage yard, trucks will transport the granulated slag. The water for granulation will be routed through a water recirculation system. The granulation units will be designed to granulate 100% of slag production. The granulated slag will be used in the cement plant proposed in the project or sold to other cement plants.

3.5.5 Sinter plant (2,101,572 to 6,754,572 TPA)

Sinter Plant plays a very important role in increasing the productivity of Blast Furnace and also in utilizing huge reserves of iron ore fines generated from crushing of ROM. 1 X 48 sq.m., 1 X 30 sq.m. and 1 X 130 sq.m. sinter plant has been sanctioned in the existing EC with a production of 2,101,572 TPA. Three new sinter machines are proposed of 2 X 130 sq.m. and 210 sq.m., to produce 4,653,000 TPA sinter, which will be adequate for feeding the blast furnace.

The configuration of sinter plant is as given in **Table 15**.

TABLE 15: CONFIGURATION OF SINTER PLANT

Description	Unit	Sanctioned capacity as per EC dt. 19.01.2021	Proposed expansion		Total quantity
Sinter Plant	Nos.	3	2	1	6
Capacity	sq.m.	48, 30& 130	130	210	48, 30, 3X130 & 210
working days	days/ annum	350 & 330	330	330	330 & 350
working hours	Hours/ day	24	24	24	24
Productivity	Tonnes/ sq.m.	1.42	1.3	1.3	1.3-1.42
Production	TPA	2,101,572	2,574,000	2,079,000	6,754,572

Process description

Flux and fuel crushing & screening section

Limestone, dolomite, coke will be stored in storage bins of adequate capacity. The materials will be crushed in crushing and grinding section and will be screened and transported by conveyor to proportioning bins.

Proportioning system

For various types of input materials, adequate number of proportioning bins mounted on load cells to ascertain material level in each bin and electronic weigh feeders under each bin shall be provided to draw materials of required proportions.

Mixing & Nodulising Drum

A combined mixing and nodulising drum with water proportioning system and calcined lime addition facilities will be provided for the sinter machine.

The drum will facilitate stage-wise intimate mixing and rolling of sinter mix where approximate amount of water and required calcined lime will be added.

Sinter machine section

Sinter machine will be complete with hearth layer feeding system, raw mix feeding system comprising anti segregation filling method at the top of raw mix feed bin and drum feeder, ignition furnace, sinter breaker, crash deck, segregation chute and the sinter strand proper comprising lifting wheel assembly, support structure, sliding bars, thermal compensation device, wind boxes with compensators, spillage chute, SG iron pallet assembly with spring loaded sealing and high chrome grate bar, lubrication system etc. Sintering will be performed during the movement of the bed from ignition furnace to the discharge end.

Suitable sinter breaker will break hot sinter cake to about 200 mm size. One elevator will be provided in sinter machine building.

Sinter cooler section

A suitable forced draft type circular cooler comprising of adequate number of fans, drives, cooler troughs, sealing etc. will be installed so that temperature of the sinter at discharge point is 1000°C (maximum). The cooler discharge hopper shall be load cell mounted. One magnet shall be provided on the product sinter conveyor after cooler to remove iron bearing material.

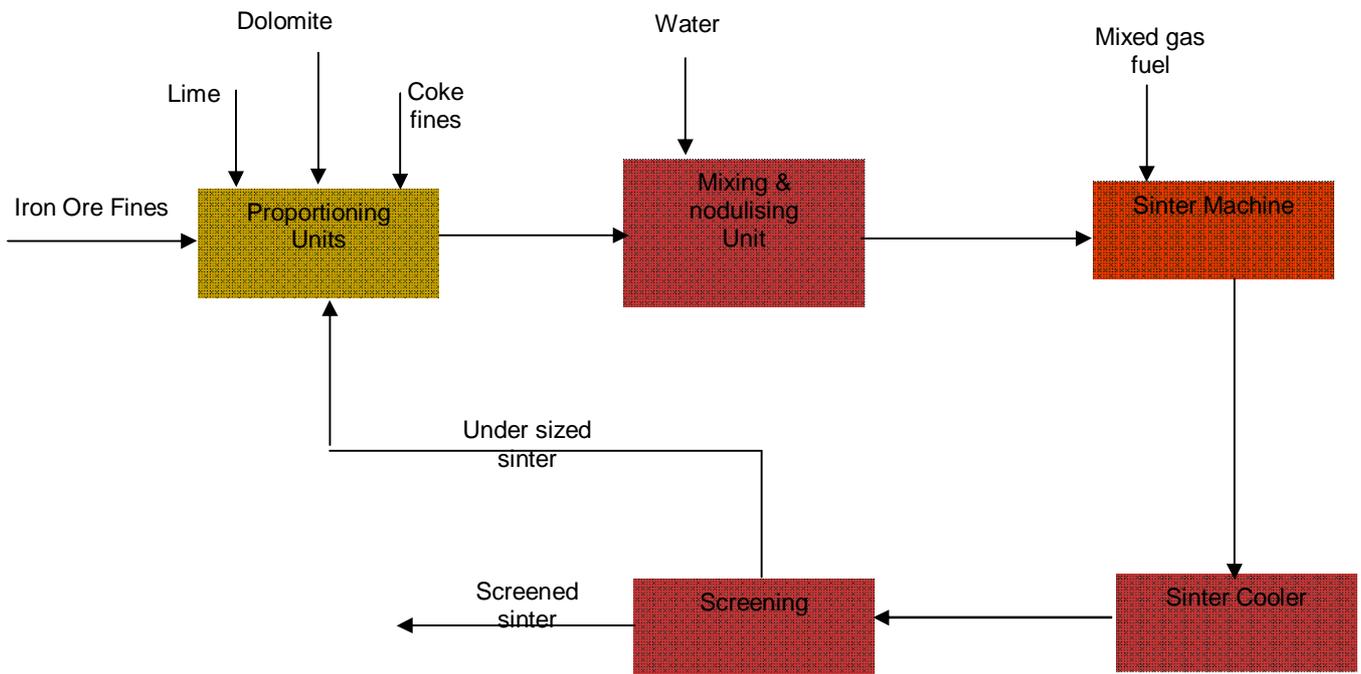
Waste heat recovery system from cooler for ignition furnace combustion system will be optional for sinter machine.

Sinter stabilizing section

Cooled sinter from sinter machine will be fed to a double roll crusher via a suitably designed separation chute. Crushed sinter of minus 50 mm size will be screened for separation of hearth layer material and plant return fines. The material balance is shown in **Table 16**. The process flow of sinter plant is shown in **Fig 6**.

TABLE 16: MATERIAL BALANCE OF SINTER PLANT (EXISTING & PROPOSED)

	Sanctioned capacity as per EC dt. 19.01.2021		Proposed Additional	Total	
	Quantity (TPA)	Specific Consumption T/T of Product		Quantity (TPA)	Quantity (TPA)
Iron Ore Fines	1,733,225	0.825	3,955,050	5,688,275	0.842
Coke Fines	184,222	0.088	465,300	649,522	0.096
Lime Stone	286,510	0.136	465,300	751,810	0.111
Dolomite	219,982	0.105	465,300	685,282	0.101
Iron ore fines from pellet	600,900	0.286	Less 600,900	-	-
Sinter return	614,772	0.293	1,395,900	2,010,672	0.298
ESP, BF dust	194,000	0.092	135,077	329,077	0.049
Dust from MBF	77,502	0.037	152,075	229,577	0.034
Bag filter dust from coke oven	41,223	0.020	76,104	117,327	0.017
BF dust from IF	49,682	0.024	27,270	76,951	0.011
BF dust from EAF/ others	19,567	0.009	68,586	88,153	0.013
Mill Scale	114,539	0.055	127,521	2,42,060	0.036
Fines from ferro alloy plant	10,821	0.005	-	10,821	0.002
Total	4,146,944	1.973	6732583	10,879,527	1.611
Outputs	Quantity (TPA)	Specific generation T/T of Product	Quantity (TPA)	Quantity (TPA)	Specific generation T/T of Product
Sinter Ore	2,101,572	1.000	4,653,000	6,754,572	1.000
Sinter Return	614,772	0.293	1,395,900	2,010,672	0.298
LOI	1,430,600	0.681	683,683	2,114,283	0.313
Total	4,146,944	1.973	6,732,583	10,879,527	1.611

FIG 6: PROCESS FLOW OF SINTER PLANT

3.5.6 Coke oven plant (910,000 to 2,590,000 TPA)

Coke oven plant has obtained EC (dt. 19.01.2021) for 13 batteries of 70,000 TPA. Based on the requirement, Rungta Mines Ltd. proposes to install 12 batteries of 70,000 TPA and 2 batteries of 420,000 TPA. The configuration of coke oven plant is given in **Table 17**.

TABLE 17: CONFIGURATION OF COKE OVEN PLANT

Description	Unit	Sanctioned capacity as per EC dt. 19.01.2021	Proposed additional		Total Quantity
Coke Oven Batteries	Nos.	13	12	2	27
Capacity	TPA	70,000	70,000	420,000	70,000 and 420,000
Working days	days/annum	350	350	350	350
Working hours	Hours /day	24	24	24	24
Production	TPA	910,000	840,000	840,000	2,590,000

Manufacturing process

Raw coal will be crushed in a crusher into powdered form and charged in the oven for carbonisation. The volatile matter in raw coal gets released in the form of gas and gets burnt in the oven as well as in the flues. After the completion of the carbonization process, raw coal get converted to coke

within 36 to 38 hours. The coke is then pushed out from the oven and quenched by water. Coke will be utilised in pelletisation plant, ferro alloy plant, MBF and sinter plant.

The hot quenching water is continuously collected into a settling tank & the coke particles are also being carried out upto the settling tank with water. These particles are allowed to be settled below the settling tank and then the water almost free from suspended is allowed to be again used for the purpose of quenching of hot coke mass. Time to time the settled particles are reclaimed and these have the large demand in mini cement plants, briquetting plants etc.

Non-recovery type coke ovens

The proposed non-recovery coke ovens will be specially developed based on the imported coking coal with a volatile matter content in the range of 20%-24%. Moisture control of coal is important as it has direct bearing on the carbonization rate & bulk density of coal.

Non-recovery coke ovens are capable of producing coke of large size, strong, dense & abrasion resistant. The coarse mosaic micro-structure, low porosity during carbonization and development of minor crack result in low reactivity, strength in high temperature, stability and superior post reaction strength. The ovens are unique in that, no external heat source is required. All the energy in carbonization is supplied by burning the gaseous volatile products released from the coal charge during carbonization.

Raw material for Coke Oven Plant

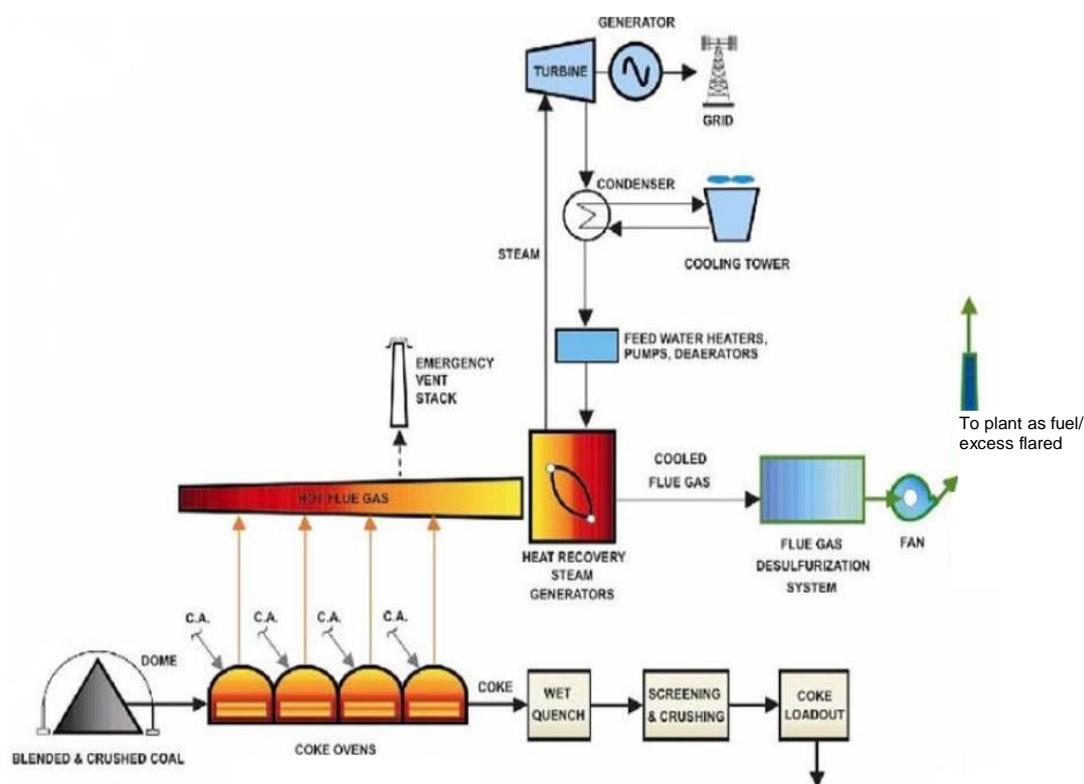
The required quantity of coking coal will be met through import from countries like Australia, China or equivalent from elsewhere. Company also will make efforts to procure from the domestic market to the maximum extent possible. For flexibility in operation, blending provisions in the plant may be incorporated to operate the plant with Indian coal or more of Indian medium coking coal and prime coking coal from suitable sources, in admixture with imported low ash coking coal. The material balance is given in **Table 18**. The process flow of coke oven is shown in **Fig 7**.

TABLE 18: MATERIAL BALANCE OF COKE OVEN (EXISTING & PROPOSED)

	Sanctioned capacity as per EC		Proposed additional	Total	
Products, TPA→	910,000				
Raw Material Inputs	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
Coking Coal	1,374,100	1.51	2,536,800	3,910,900	1.51
Total	1,374,100	1.51	2,536,800	3,910,900	1.51

Out puts	Quantity (TPA)	Specific generation T/T of Product	Quantity (TPA)	Quantity (TPA)	Specific generation T/T of Product
Coke	910,000	1	1,680,000	2,590,000	1.000
Bag Filter Dust	41,223	0.045	76,104	117,327	0.045
Losses	422,877	0.465	780,696	1,203,573	0.465
Total	1,374,100	1.51	2,536,800	3,910,900	1.51

FIG 7: PROCESS OF COKE OVEN PLANT



3.5.7 Steel melting shop (2,880,500 to 7,018,500 TPA)

The Steel Melt Shop will comprise of Induction Furnaces and Electric Arc furnace. Details are described in subsequent paragraph

3.5.7.1 Induction Furnace- LRF-CCM Route (2,040,500 to 3,160,500 TPA)

The configuration for existing and proposed SMS via IF-LRF-CCM route is given in **Table 19**. A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 19: CONFIGURATION OF SMS VIA IF ROUTE (EXISTING & PROPOSED)

Description	Sanctioned capacity as per EC	Proposed additional	Total
Induction Furnace	25	20	45
Capacity	12 no. X 15 T, 13 no. x 20 T	20 no. x 20 T	12 no. X 15 T, 13 no. x 20 T, 20 no. x 20 T
No. of Heat	11	8	11, 8
CCM	5	2	7
Strands	4	4	4
No. of working days	350	350	350
No. of working hrs	24	24	24
Production (Total)	2,040,500	1,120,000	3,160,500

Induction furnace works on the principle of induction melting of scrap/ sponge iron with the help of electric power. An alternating electromagnetic field induces eddy current in the metal so that the electrical energy converts into heat, whose quantity depends on the resistivity of the charge. Induction furnaces operate on current of commercial frequencies (50Hz) or on current of higher frequencies from 500 to 2000 Hz. These furnaces are beneficial in steel making for low melting loss.

An induction furnace constitutes a single larger primary coil made of water-cooled copper tube. The working voltage is impressed across the terminals of the coil. The furnace has a rammed lining.

The ramming material silica mass contains should more than 96% silica and minimum of Al_2O_3 & Fe_2O_3 . Before ramming the material, a steel template is kept inside the furnace and the material is rammed between the template and the insulated coil of the induction heater. To minimize the consumption of electric power and cut down the melting period, the crucible wall must be as thin as possible. The inside of crucible lining is in contact with liquid metal while it's outside surface contacts the water-cooled induction.

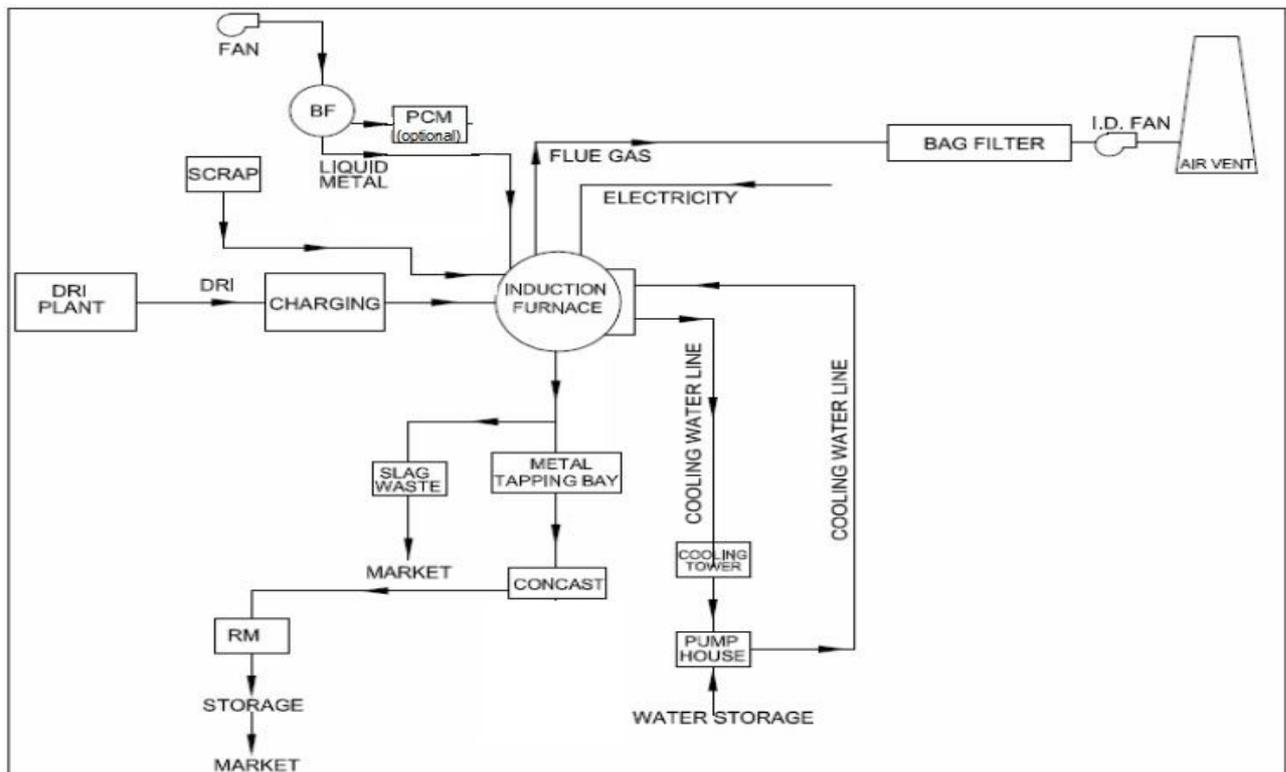
The LF will be complete with the transformer, ladle stirring system, aluminum wire feeder, carbon injecting device, additives storage and addition system, sampling and temperature measuring device. A fume extraction and cleaning system consisting of bag filters, ID fan and chimney with the related duct work will be provided.

Charging: The scrap pieces/ sponge iron/ hot metal should be small in size to provide good compaction, without leaving spacing between the charge and crucible wall. This offer an advantage of quick melting of the charge with a minimum power spent in the stage for the heat. Large and high melting pieces should stand parallel and close to the crucible while low melting components should be in the middle of the crucible. Small capacity furnaces are loaded manually and the large capacity furnaces with the aid of buckets. Material balance is given in **Table 20**.

TABLE 20: MATERIAL BALANCE OF SMS VIA IF ROUTE (EXISTING & PROPOSED)

Raw Material Inputs	Sanctioned capacity as per EC		Proposed	Total	
	Quantity(TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
DRI	1,990,404	0.98	1,120,000	3,110,404	0.98
Pig Iron / Hot Metal	349,039	0.17	182,609	531,647	0.17
Steel Scrap	116,277	0.06	60,870	177,147	0.06
Total	2,455,720	1.20	1,363,478	3,819,198	1.21
Outputs	Quantity	Specific Generation (T/T)	Quantity	Quantity	Specific Generation (T/T)
Liquid metal to CCM	2,040,500	1.00	1,120,000	3,160,500	1.00
Losses	185,197	0.09	27,270	76,951	0.02
Slag	230,023	0.11	216,209	581,747	0.18
Total	2,455,720	1.20	1,363,478	3,819,198	1.21

FIG 8: PROCESS FLOW SHEET OF INDUCTION FURNACE



3.5.7.2 Electric arc furnace/ Basic Oxygen Furnace/ Energy Optimisation Furnace/ New Oxygen Furnace-LRF-CCM Route (840,000 to 3,858,000)

The configuration for existing and proposed SMS via EAF/ BOF/ EOF/ NOF-LRF-CCM route is given in **Table 21**. A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 21: CONFIGURATION OF SMS (EAF/BOF/ NOF/ EOF ROUTE)

Description	Unit	As per existing EC	Proposed Additional	Total after expansion
Electric Arc Furnace/ Basic oxygen furnace/ Energy Optimisation Furnace/ New Oxygen Furnace	Nos.	1	5	6
Capacity	Ton	100	2x65 T, 2x45T, 1x75T	1x100 T, 2x65 T, 2x45T, 1x75T
Vaccum degassing / AOD	T	1X30 T + 1X100 T	-	1X30 T + 1X100 T
RH/VD/AOD	T	-	2x65 T + 1x75 T + 2x45 T	2x65 T + 1x75 T + 2x45 T
CCM	Nos.	3	3	6
Strands	Nos.	4	4	4
Working days	days/Annum	350	330	330 & 350
Working hours	Hours /Day	24	24	24
No. of Heats through BOF route	Heats	24	30, 34	24, 30, 34
Production	TPA	840,000	3,018,000	3,858,000

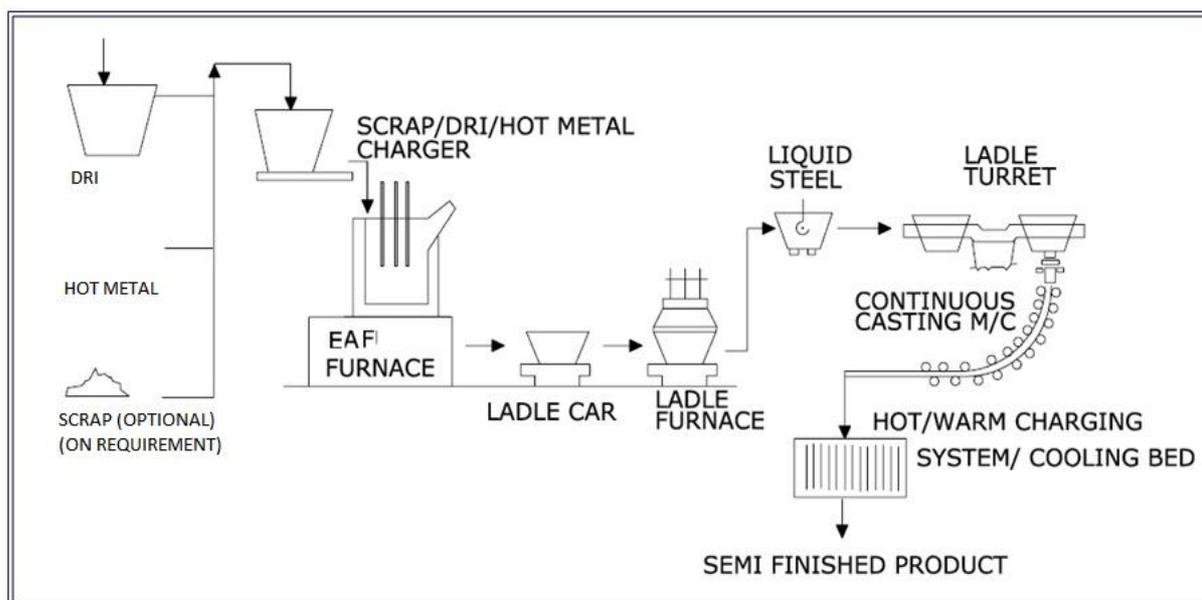
Electric arc is generated between electrodes which heats the metallic charge. In both furnaces, the melted contents separate into liquid metal and slag. The slag is removed and considered as waste. The liquid metal is sent to the continuous casting machine (CCM) where semi-finished product is made.

The electric arc furnace (EAF) is thus particularly well suited to the production of the full range of alloy steel grades. In the case of the basic oxygen steel making processes (BOF), on the other hand, the danger arises that the expensive alloying elements will be absorbed at least in part by the slag. New Oxygen Furnace (NOF) has a controlled and efficient steel making process. NOF has the flexibility of converting various charge mix of raw material i.e. from 100 per cent DRI to 90 per cent Hot Metal (Zero Electric Power) into steel efficiently. One of the most remarkable aspects of an EAF is the ultralow phoscontent (< 0.01 %) which may be reached consistently, without impairing the high productivity of the furnace.

The charge mix being considered for the Furnaces is 20% DRI and 67% hot metal/ pig iron. The material balance is given in **Table 22**. Process flow sheet of an EAF is given in **Fig 9**.

TABLE 22: MATERIAL BALANCE OF SMS VIA EAF/ BOF/ NOF/ EOF ROUTE (EXISTING & PROPOSED)

Raw Material Inputs	Sanctioned capacity as per EC		Proposed	Total	
	Quantity(TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
DRI	431,325	0.51	583,023	1,014,348	0.26
Hot Metal/Pig Iron from MBF	547,003	0.65	2,846,289	3,393,292	0.88
Lime	167,046	0.20	462,000	629,046	0.16
Total	1,145,374	1.36	3,891,312	5,036,686	1.3
Outputs	Quantity	Specific Generation (T/T)	Quantity	Quantity	Specific Generation (T/T)
Liquid metal to CCM	840,000	1.00	3,018,000	3,858,000	1.00
BF dust	19567	0.02	68,586	88,153	0.02
Slag	252,398	0.30	712,326	964,724	0.25
Losses	33,409	0.04	92,400	125,809	0.03
Total	1,145,374	1.36	3,891,312	5,036,686	1.3

FIG 9: PROCESS FLOW SHEET OF ELECTRIC ARC FURNACE

3.5.8 Billets / bloom/ slab caster (2,822,890 to 6,919,510 TPA)

3.5.8.1 Billets / bloom/ slab caster from IF route (1,999,690 to 3,108,490 TPA)

The Caster is complete with ladle stand, mould assembly, Strand guide segments and supports withdrawal and straightening system, mould cooling system, Cut- off equipment including length measuring device, marking machine etc. There are three billet/ bloom/ slab casters of 339,570 TPA and one of 980,980 TPA sanctioned in the existing EC. And additional 1,108,800 TPA billet/ bloom/ slab caster will be installed to cater to the output from the SMS via IF route. Material balance is given in **Table 23**.

TABLE 23: MATERIAL BALANCE OF BILLETS / BLOOM/ SLAB CASTER (FROM IF) (EXISTING & PROPOSED)

Raw Material Inputs	Sanctioned capacity as per EC		Proposed	Total	
	Quantity(TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
Liquid metal to CCM	2,040,500	1.02	1,120,000	3,160,500	1.02
Total	2,040,500	1.02	1,120,000	3,160,500	1.02
Outputs	Quantity	Specific Generation (T/T)	Quantity	Quantity	Specific Generation (T/T)
Semi-Finished Product from CCM	1,999,690	1.00	1,108,800	3,108,490	1.00
Mill Scale	40,810	0.02	11,200	52,010	0.02
Total	2,040,500	1.02	1,120,000	3,160,500	1.02

3.5.8.2 Billets/ Bloom/ Slab Caster VIA EAF/ BOF/ NOF/ EOF Route (832,200 to 3,811,020 TPA)

There is one billet/ bloom/ slab casters of 832,200 TPA sanctioned in the existing EC. And additional three billet/ bloom/ slab caster of capacity 1,274,130 TPA, 882,090 TPA and 831,600 TPA will be installed to cater to the output from the SMS via EAF/ BOF/ NOF/ EOF route. Material balance is given in **Table 24**.

TABLE 24: MATERIAL BALANCE FOR CCM VIA EAF/ BOF/ NOF/ EOF ROUTE (EXISTING AND PROPOSED)

Raw Material Inputs	Sanctioned capacity as per EC		Proposed	Total	
	Quantity(TPA)	Specific Consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (T/T)
Liquid metal to CCM	840,000	1.02	3,018,000	3,858,000	1.01
Total	840,000	1.02	3,018,000	3,858,000	1.01
Outputs	Quantity	Specific Generation (T/T)	Quantity	Quantity	Specific Generation (T/T)
Semi-Finished Product from CCM	823,200	1.00	2,987,820	3,811,020	1.00
Mill Scale	16,800	0.02	30,180	46,980	0.01
Total	840,000	1.02	3,018,000	3,858,000	1.01

3.5.9 Rolling Mill, Strip Mill & Ductile Pipe Plant (3,227,964 to 7,167,964 TPA)

Semi-finished product from the CCMs of IF and EAF/ BOF/ EOF/ NOF is converted into finished products such as TMT, Flat, Round, Wire Rod, Structural, Ductile pipe and others products. The configuration of existing and proposed Rolling Mill is given below:

Facilities	Unit	Existing as per EC	Proposed additional	Total
Rolling mill (I)	TPA	325,988		
Rolling mill (II)	TPA	325,988		
Rolling mill (III)	TPA	325,988		
Rolling mill with Annealing & Pickling & Galvanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others)	TPA	1,550,000 (1X0.5 + 1X0.45 + 2X0.3 MTPA)	-	1,550,000 (1X0.5 + 1X0.45 + 2X0.3 MTPA)
Rolling mill with Pickling & Galvanizing line (strip mill / sheet / coil/wire rod/structural / others)	TPA	200,000	-	200,000
Ductile Pipe Plant	TPA	500,000 (1X0.2 + 1X 0.3 MTPA)	-	500,000 (1X0.2 + 1X 0.3 MTPA)
Rolling Mill (Long/TMT/ Flat/Strip/ Round/ Wire Rod/Hot Rolled/HRC/ /Structural Mill/Plate/ Pipe& Tube Products /wire drawing etc)	TPA	-	2,740,000 (2 X 0.55 MTPA+2X0.42 MTPA+1X0.8MTPA)	2,740,000 (2 X 0.55 MTPA+2X0.42 MTPA+1X0.8MTPA)
Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Tin Plate/ Electrical Steel/ CRGO/ Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold rolling, annealing, galvanizing and colour coating	TPA	-	1,200,000	1,200,000
	Total	3,227,964	3,940,000	7,167,964

3.5.9.1 Rolling Mills (Rolling mill with Annealing & Pickling & Galvanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others) **(2,527,964, No Change)**)

The finished product facilities configuration is given in **Table 25**.

TABLE 25: CONFIGURATION OF ROLLING MILL AS PER EC DT. 19.01.2021

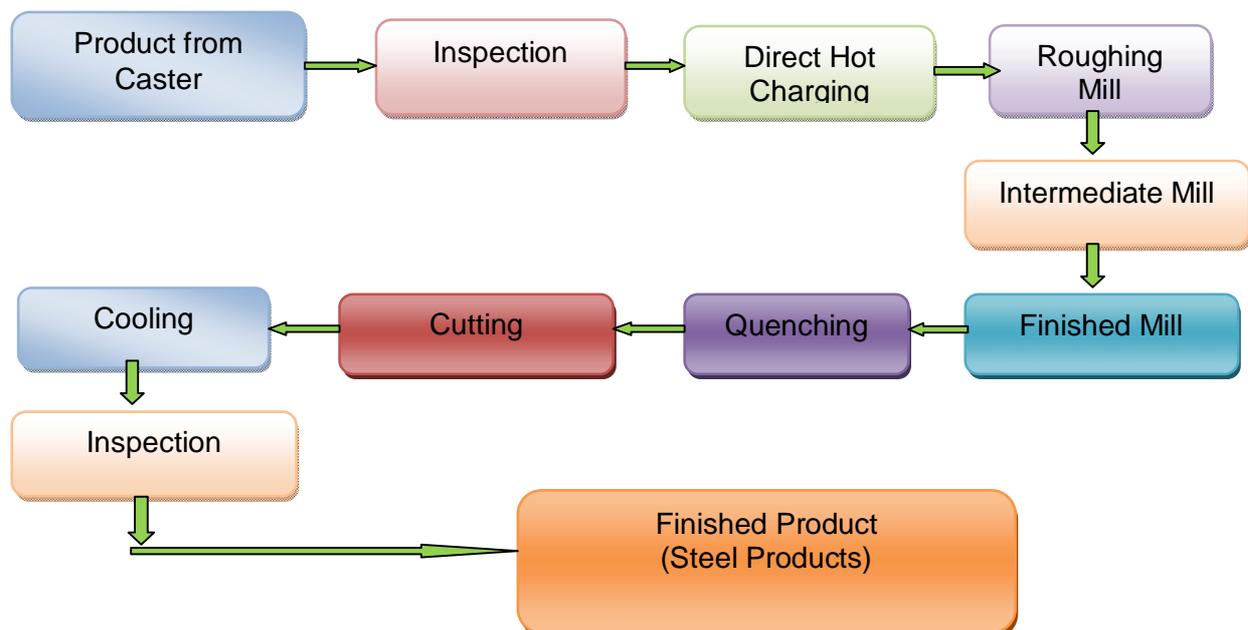
Description	Unit	Sanctioned capacity as per EC
Rolling Mill	Nos.	7
working days	days/Annum	350
Working hours	Hours /Day	22 max
Production		
3 x 325,988 TPA	TPA	977,964
1 x 500,000 TPA	TPA	500,000
1 x 450,000 TPA	TPA	450,000
2 x 300,000 TPA	TPA	600,000
Total	TPA	2,527,964

The Material balance for Rolling Mill is given in the **Table 26**. Process flow of Rolling mill is given in **Fig 10**.

TABLE 26: MATERIAL BALANCE OF ROLLING MILL (EXISTING)

Raw Material Inputs	Sanctioned capacity as per EC	
	Quantity (TPA)	Specific Consumption (T/T)
Semi-Finished Product from IF-CCM	1,999,690	0.79
Semi finished from EAF	618,556	0.24
Total	2618246	1.04
Outputs	Quantity (TPA)	Specific Generation (T/T)
Finished Product	2,527,964	1.00
Reject	36,719	0.01
Mill Scale	53,563	0.02
Total	2,618,246	1.04

FIG 10: PROCESS FLOW OF ROLLING MILL



3.5.9.2 Rolling mill with Pickling & Galvanizing line(strip mill / sheet / coil/wire rod/structural / others) (200,000 TPA, No Change)

The strip mill has obtained EC for production of 200,000 TPA and there will be no change in it. Semi finished product from the CCMs of EAF/BOF will be converted into finished products such as Strip, Sheet, Coil, Wire, Bar and Wire Rope. Configuration of Strip mill is given in **Table 27**.

**TABLE 27: CONFIGURATION OF STRIP MILL
AS PER EC DT. 19.01.2021**

Description	Unit	Total
Strip Mill	Nos.	1
Working days	days/Annum	350
Working hours	Hours /Day	20
Production	TPA	200,000

The material balance for Strip Mill is given in the **Table 28**.

TABLE 28: MATERIAL BALANCE OF STRIP MILL (EXISTING)

Raw Material Inputs	Specific Consumption (T/T)	Quantity (TPA)
Semi Finished Product from CCM	1.02	204,644
Total	1.02	204,644
Outputs	Specific Generation (T/T)	Quantity (TPA)
Finished Product	1.00	200,000
Reject	0.01	2,090
Mill Scale	0.01	2,554
Total	1.02	204,644

3.5.9.3 Ductile Pipe Plant (500,000 TPA, No Change)

The ductile pipe plant has obtained EC for production of 500,000 TPA and there will be no change in it. Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes. Configuration of Ductile Pipe Plant is given in **Table 29**.

**TABLE 29: CONFIGURATION OF DUCTILE PIPE PLANT
AS PER EC DT. 19.01.2021**

Description	Unit	Quantity
Ductile Pipe Plant	Nos.	2
working days	Days/Annum	350
working hours	Hours /Day	20
Plants		
Ductile plant 1	TPA	200,000
Ductile plant 2	TPA	300,000
Total	TPA	500,000

The Material balance for Ductile Pipe Plant is given in the **Table 30**.

TABLE 30: MATERIAL BALANCE OF DUCTILE PIPE PLANT (EXISTING)

Raw Material Inputs	Specific Consumption (T/T)	Total Quantity (TPA)
Hot Metal from Blast Furnace	1.02	510,204
Total	1.02	510,204
Outputs	Specific Generation (T/T)	
Finished Product	1.00	500,000
Reject	0.01	4,592
Mill Scale	0.01	5,612
Total	1.02	510,204

3.5.9.4 Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ Cold Rolled/ Structural Mill/ Pipe& Tube Products / Skin Passed/ Plate/ Tin Plate/ along with Annealing-Pickling-Galvanising-Colour Coated-Electrical Steel CRGO Lines-wire drawing etc) (3,940,000 TPA, New unit)

Configuration of proposed rolling mill is given in **Table 31**.

TABLE 31: PROPOSED CONFIGURATION

Description	Unit	Proposed capacity
Rolling Mill	Nos.	8
working days	days/annum	330
Working hours	Hours /day	20
Production		
Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Plate/ Pipe& Tube Products/ wire drawing etc)	TPA	2,740,000 (2 X 0.55 MTPA+2X0.42 MTPA+1X0.8MTPA)
Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/HRC/ Structural Mill/ Tin Plate/ Electrical Steel CRGO/ Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold rolling, annealing, galvanizing and colour coating	TPA	1,200,000
Total	TPA	3,940,000

Material balance is given in **Table 32**.

TABLE 32: MATERIAL BALANCE OF ROLLING MILLS (PROPOSED)

Raw Material Inputs	Quantity(TPA)	Specific Consumption (T/T)
Semi-finished product from IF	1,108,800	0.28
Semi-finished product from EAF/ EOF/ NOF/ BOF	2,987,820	0.76
Total	4,096,620	1.04
Outputs		
Finished Product	3,940,000	1.00
Reject	70,479	0.02
Mill Scale	86,141	0.02
Total	4,096,620	1.04

3.5.10 Producer Gas Plant (661,000 Nm³/hr)

A producer gas plant (PGP) of 661,000 Nm³/hr has been sanctioned in the EC dt. 19.01.2021. The configuration of the producer gas plant has been arrived at as shown in **Table 33**.

TABLE 33: CONFIGURATION OF PRODUCER GAS PLANT AS PER EC DT. 19.01.2021

Sl. No.	Description	Unit	Total
1	Heat required for one ton of Pellet	KCal/Ton	220,000
2	Total Pellet Production	TPA	25,000,000
3	Total Heat Required	KCal/Year	542.08 X 10 ¹⁰
4	CV of Producer Gas	KCal/Nm ³	1,000-1,375
5	Design CV of Producer Gas	KCal/Nm ³	1,000-1,360
6	Producer Gas Requirement	Nm ³ /Year	525.19 X 10 ⁷
7	No. of Operational Day per Annum	Days	330 & 350
8	No. of Operational Hours per Day	Hours	24
9	Per Hour Requirement	Nm ³ /Hr	661,000
10	Per Unit Capacity	Nm ³ /Hr	3,000 & 12,500 & 7,500
11	No. of Units	Nos.	77

The material balance is given in **Table 34**.

TABLE 34: MATERIAL BALANCE OF PRODUCER GAS PLANT

Production, NM³/hr-->	660,833.3	
Production, NM³/yr-->	5,258,200,000	
	Total	
Raw Material Inputs	Quantity (TPA)	Specific Consumption (T/Nm³ of PG)
Coal	1,654,442	0.00032
Total	1,654,442	0.00032

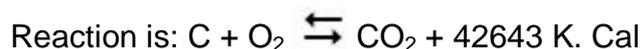
Production, NM ³ /hr-->	660,833.3	
Production, NM ³ /yr-->	5,258,200,000	
	Total	
Outputs	Quantity (TPA)	Specific Generation (T/Nm³ of PG)
Coal Ash	415,397	0.00009
Coal Tar	69,987	0.00001
Losses on ignition & gas	1,167,058	0.00022
Total	1,654,442	0.00032

Process Description

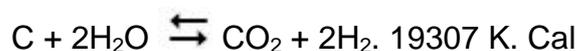
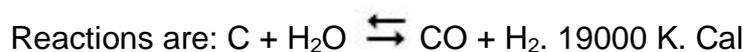
The process stages for Producer Gas are as follows:

1. Crushed coal of the specified quality and size is carried to the top of the bunker by means of Bucket Elevator and is put to the bunker. The screen between the bunker and the Bucket Elevator separates out fines from the feed stock of Coal which is taken down through a chute.
2. Coal from the bunker is fed into the Extended Shaft of the Gasifier through a Sector Gate and two Bell Cones operated by pneumatic power cylinders which open out the Sector Gate and Bell Cones sequentially after getting signal from the LTC temperature whenever it touches the set temperature of 140°C or so.
3. Fed coal travels downwards and gets dried first and then gradually preheated up to a distillation temperature of about 450°C by the product gas moving upwards which itself gets gradually cooled down and picks up the volatile matter of coal and gets auto-carbureted to a much higher calorific value before it comes out to the L.T.C off take pipes. The coal, on the other hand, gets carbonized to nearly coke stage and its reactivity increases for a faster gasification.
4. When the coal enters through the generator bottom shaft, reaction between coal and (air + steam) occurs and following reactions take place from bottom oxidation zone to top reduction zones.

a) Oxidation zones:

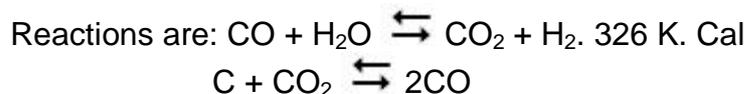


b) Primary Reduction zone :



(Within 300 mm from Oxidation zone)

c) Secondary Reduction zone :



Besides above reaction zones, there is an ash zone under the oxidation zone through which calculated quantity of air saturated with steam enters and receives heat from the ash, gets preheated and proceeds upwards to the oxidation zone. The ash on the other hand gets cooled down before it comes out to the ash pan.

5. The distillation zone starts from the top of Secondary Reduction Zone and extends upward to about 2500 mm or so in which considerable quantity of volatile matter (about more than 75%) gets stripped and picked up by gas.
6. At the top, there is preheating zone and above all there is drying zone.

3.5.11 Oxygen plant (161,700,000 to 749,700,000 cum/annum)

The Oxygen Plant is required to meet the oxygen & argon requirement for mini blast furnace & electric arc furnace to improve lance, which reduces the electricity consumption and also reduces considerable tap to tap time increasing productivity. Occasional purging need of the steel plant will be met by nitrogen, which will also be generated from the oxygen plant. Existing configuration of oxygen plant is given in **Table 35** and proposed configuration of oxygen plant is given in **Table 36**.

**TABLE 35: CONFIGURATION OF OXYGEN PLANT
(AS PER EC DATED 19.01.2021)**

Description	Unit	As per sanctioned capacity				
		458500 (MBF-1)	238420 (MBF-2)	840000 (EAF/ EOF)*	840000 (AOD)*	853125 (MBF-2)
Capacity of MBF/ EAF	TPA	458500 (MBF-1)	238420 (MBF-2)	840000 (EAF/ EOF)*	840000 (AOD)*	853125 (MBF-2)
Oxygen required for 1 Ton Liquid Steel	Cum/ T	55	55	70	10	55
Working Days	Days/ annum	350	350	350	350	350
Working Hours	Hours/ day	24	24	24	24	24
Daily requirement of Oxygen	cum/ day	69300	37,466	168,000	240,00	134,063
Oxygen Volume	Cum/ ton	700	700	700	700	700
Daily requirement of Oxygen in Ton	TPD	99	58	240	34	191
Plant Capacity	TPD	1x100, 1x200, 2x150				

**Only one of the two will be operated at a time.*

**TABLE 36: CONFIGURATION OF OXYGEN PLANT
(PROPOSED ADDITIONAL)**

Description	Unit	Proposed Additional				
		864,500 (MBF-3)	864,500 (MBF-4)	1,312,500 (MBF-5)	3,018,000 (EOF)*	3,018,000 (AOD)*
Capacity of MBF/ EAF	TPA	864,500 (MBF-3)	864,500 (MBF-4)	1,312,500 (MBF-5)	3,018,000 (EOF)*	3,018,000 (AOD)*
Oxygen required for 1 Ton Liquid Steel	Cum/ T	55	55	55	70	10
Working Days	Days/ annum	350	350	350	330	330
Working Hours	Hours/ day	24	24	24	24	24
Daily requirement of Oxygen	cum/ day	135850	135850	206250	640182	91455
Oxygen Volume	Cum/ ton	700	700	700	700	700
Daily requirement of Oxygen in Ton	TPD	194	194	295	915	131
Plant Capacity	TPD	2x600, 1x1200				

Material balance of oxygen plant is given in **Table 37**.

TABLE 37: MATERIAL BALANCE OF OXYGEN PLANT

Raw Material Inputs	Specific Production/ Generation of Product	Constituent	Sanctioned as per EC Quantity, TPA	Proposed Additional, TPA	Total Quantity, TPA
Air	4.76	100%	1,000,000	4,100,000	5,100,000
Total	4.76	100%	1,000,000	4,100,000	5,100,000
Products Outputs					
Oxygen	1.000	21.00%	210,000	861,000	1,071,000
Nitrogen	3.714	78.00%	780,000	3,198,000	3,978,000
Argon	0.048	1.00%	10,000	41,000	51,000
Total	4.76	100%	1,000,000	4,100,000	5,100,000

3.5.12 Lime plant (171,500 to 633,500 TPA)

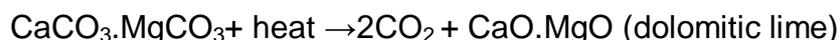
Lime and dolomite are commonly used in converters and electric arc furnaces, where they help to form slag which draws off harmful impurities such as silicon and phosphorus. Lime is also used to improve productivity in the ore agglomeration process. Configuration of Lime Plant are given in **Table 38**.

TABLE 38: CONFIGURATION OF LIME PLANT

Description	Unit	Sanctioned as per EC	Proposed additional	Total Quantity
Working Days	Days/annum	350	350	350
Working Hours	Hours	24	24	24
Plant Capacity	TPD	90 & 400	600 & 2x400	90, 600 & 3x400
Annual Capacity	TPA	171,500	462,000	633,500

Process Description

Lime is the high-temperature product of the calcinations of limestone. Although limestone deposits are found in many states, only a small portion is pure enough for industrial lime manufacturing. To be classified as limestone, the rock must contain at least 50% calcium carbonate. When the rock contains 30-40% magnesium carbonate, it is referred to as dolomitic limestone. Lime can also be produced from aragonite, chalk, marble & sea shells. Lime is manufactured in various kinds of kilns by one of the following reactions:



Material balance of lime plant is given in **Table 39**.

TABLE 39: MATERIAL BALANCE OF LIME PLANT (EXISTING & PROPOSED)

Raw Material Inputs	Specific Consumption (T/T of Product)	Existing as per EC, TPA	Proposed Additional, TPA	Total after expansion, TPA
Lime Stone	1.8	308,700	831,600	1,140,300
Fuel Oil	0.2	34,300	92,400	126,700
Total	2	343,000	924,000	1,267,000
Outputs	Specific Generation (T/T of Product)			
Lime production	1	171,500	462,000	633,500
LOI & others	1	171,500	462,000	633,500
Total	2	343,000	924,000	1,267,000

3.5.13 Cement plant (2,805,000 to 4,357,500 TPA)

The EC has been obtained for 2X2500 + 2X1000 + 1500 TPD cement plant for production of 2,805,000 TPA. Additional 3x1500 TPD is proposed for production of 1,552,500 TPA. The existing and proposed Cement Plant configuration is given in **Table 40**.

TABLE 40: CONFIGURATION OF CEMENT PLANT (EXISTING AND PROPOSED)

Cement Plant	Unit	As per EC	Proposed Additional	Total
Units	Nos.	5	3	8
Capacity	TPD	2x2,500 + 2X1,000 + 1X1,500	1,500	2x2,500 + 2X1,000 + 4X1,500 TPD
Working days	days/year	330	345	330 & 345
Working hours	Hrs /Day	24	24	24
Total	TPA	2,805,000	1,552,500	4,357,500

Process Description

Company will install cement plant manufacturing Portland Pozzolana Cement (PPC) using fly ash and Portland Blast Furnace Slag Cement (PBFS) using blast furnace slag. Only grinding unit will be established and no clinker unit is proposed. Clinker will be purchased.

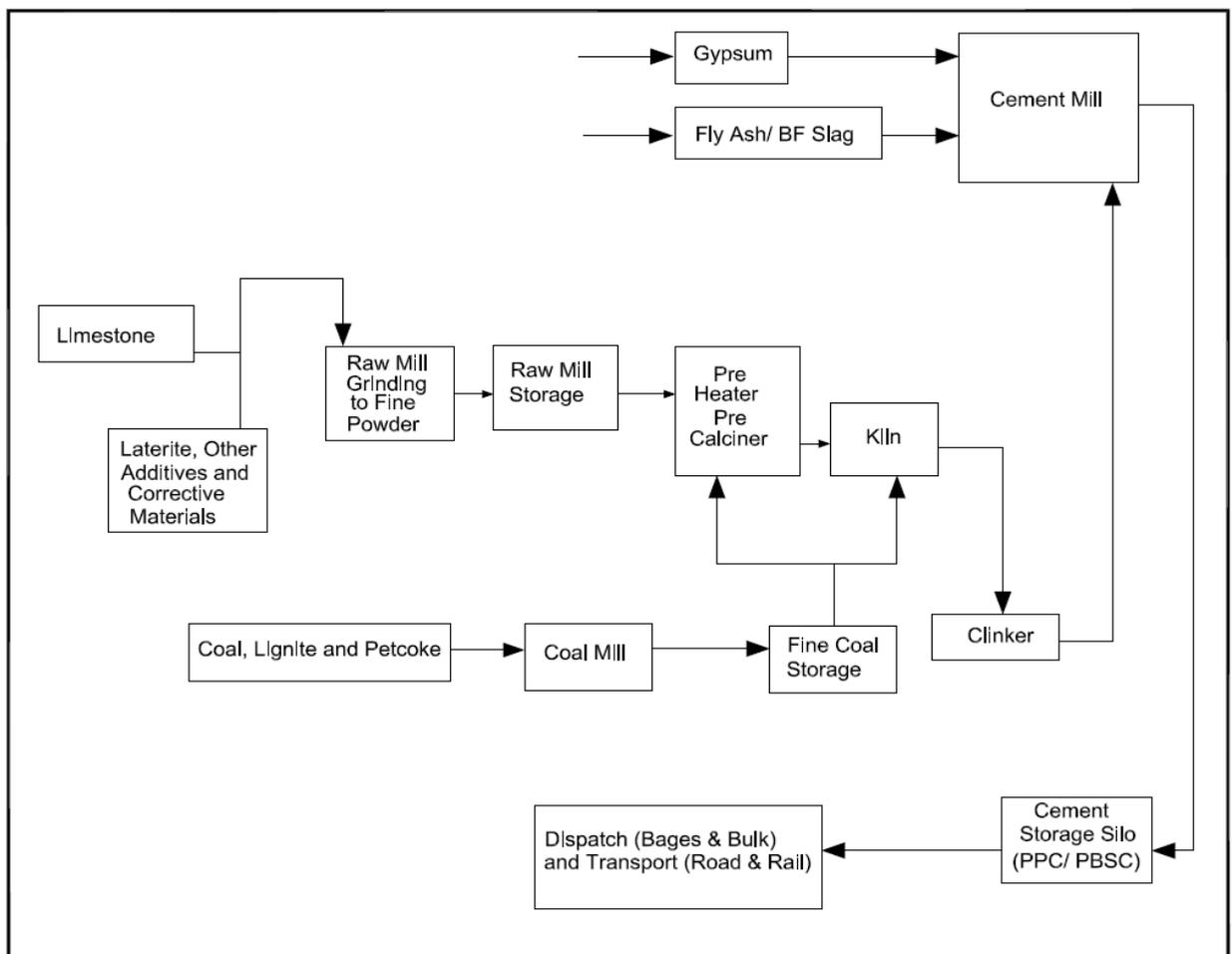
Material balance of cement plant is given in **Table 41**. The typical process diagram for cement manufacturing is depicted in the **Fig 11**.

TABLE 41: MATERIAL BALANCE CEMENT PLANT (EXISTING AND PROPOSED)

Raw Material Inputs	As per EC		Proposed additional	Total after Expansion	
	Quantity (TPA)	%		Quantity (TPA)	Quantity (TPA)
Portland Blast Furnace Slag Cement					
Slag Generation from Blast Furnace	301,526	30%	938,388	1,363,709	68%
Slag Generation from Previous EC's Blast furnace	123,795	12%			
Clinker	536,716	53%	0	536,716	27%
Gypsum	51,690	5%	45,718	97,408	5%
Coal (For Drying)	30,000		29,123	59,123	
Sub Total (PBFS Cement)			984,106	1,997,832	

Portland Pozzolana Cement					
	Revised Existing	%			%
Fly Ash from Middlings & Char	447818	25%	142,099	589,917	25%
Clinker	1253891	70%	397,876	1,651,768	70%
Gypsum	89,564	5%	28,419	117,983	5%
Sub Total (PPC Cement)	1,791,274		568,395	2,359,668	
Total	2,835,000		1,581,623	4,416,623	
Outputs	Quantity (TPA)	%	Quantity (TPA)	Quantity (TPA)	%
Cement	2,805,000	98.9%	1,552,500	4,357,500	98.7%
Losses	30,000	1.1%	29,123	59,123	1.3%
Total	2,835,000	100%	1,581,623	4,416,623	100.0%

FIG 11: MANUFACTURING PROCESS



3.5.14 Captive power plant (657 to 1,252 MW)

3.5.14.1 WHRB power generation unit (237 to 602 MW)

237 MW WHRB based power plant has already obtained EC including TRT, which will be revised to 272 MW and additional 330 MW WHRB is proposed for reutilization of flue gas from DRI exit gases, coke oven gases and blast furnace gas. For waste heat recovery boiler, the power generation is given in **Table 42**.

**TABLE 42: CONFIGURATION OF WHRB CONFIGURATION OF CPP
(EXISTING & PROPOSED)**

Facilities	Sanctioned capacity as per EC & CTE	Revised existing	Proposed Additional	Total
WHRBs connected with 8 x 100 TPD DR Kilns	26 MW	26 MW	-	26 MW
WHRBs connected with 2 x 350 TPD DR Kilns	23 MW	23 MW	-	23 MW
WHRBs connected with 4 x 900 TPD DR Kilns	120 MW	120 MW	-	120 MW
WHRBs connected with 4 x 900 TPD DR Kilns	-	-	120 MW	120 MW
WHRB connected with MBFs	30 MW	30 MW	70 MW	100 MW
WHRB connected with MBFs TRT	8 MW	8 MW	20 MW	28 MW
WHRB connected with Coke Oven	30 MW	65 MW	120 MW	185 MW
Total Power (MW)	237 MW	272 MW	330 MW	602 MW

The waste heat recovery boilers consist of radiation chambers with water walls just like conventional boiler with a drum to evaporate steam at 34 kg/cm² pressure. The steam is carried to super heater system where the temperature is maintained at 485°C. The boiler has an economizer, which utilises the heat of outgoing gases to raise the temperature of feed water from 100 to 200°C. The steam is used to rotate the turbine and to generate power. The condensed steam is collected and recycled to the boilers as boiler feed water. A DM water plant is provided for preparation of de-mineralized water for make-up to the steam-condensate cycle.

The output of the boilers will be used to generate electricity through Steam Turbo Generator Sets of capacities as mentioned above. The flue gases leave the economizer zone at about 150°C. The gases are passed through ESPs, where the dust concentration is brought down to below 50 mg/m³.

3.5.14.2 AFBC/ CFBC Power generation unit (420 to 650 MW)

420 MW AFBC based power plant has already obtained EC. Additional 230 MW power plant based on coal fines and char from DRI kilns has been proposed. Configuration of AFBC/ CFBC based power plant is given in Table 43.

TABLE 43: CONFIGURATION OF CPP (EXISTING & PROPOSED)

Description	Unit	Sanctioned Capacity as per EC	Proposed	Total Quantity
AFBC/ CFBC units	Nos.	13	4	17
AFBC/ CFBC Capacity	TPH	1x115, 2x195, 2x145, 7x100, 1x290	3x260, 1x140	1x115, 2x195, 2x145, 7x100, 1x290, 3x260, 1x140
Working days	Per/ Annum	350 & 355	350	350 & 355
Working hours	Hours /Day	24	24	24
Total Production Capacity	MW	420	230	650

Material balance for the CPP is given in Table 44.

TABLE 44: MATERIAL BALANCE OF CPP (EXISTING AND PROPOSED)

	Sanctioned capacity as per EC		Proposed Additional	Total	
Production, MW-->	420		230	650	
Raw Material Inputs	Quantity (TPA)	Specific Consumption (kg/MWH)	Quantity (TPA)	Quantity (TPA)	Specific Consumption (kg/MWH)
Middlings	508,725	0.144	-	508,725	0.093
Char	504,020	0.143	385,961	889,981	0.163
Coal (purchased)	1,442,918	0.409	762,341	2,205,259	0.404
Coal fines	267,153	0.076	-	267,153	0.049
Lime stone	33,600	0.010	14,625	48,225	0.009
Total	2,756,416	0.781	1,162,927	3,919,343	0.718

Outputs	Quantity (TPA)	Specific Generation (kg/MWH)	Quantity (TPA)	Quantity (TPA)	Specific Generation (kg/MWH)
Material handling loss	97,398	0.028	58,146	155,544	0.028
Ash	1,293,546	0.367	594,520	1,888,066	0.346
Material loss	1,365,472	0.387	510,260	1,875,733	0.344
Total	2,756,416	0.781	1,162,927	3,919,343	0.718

Coal Handling System

Coal fines are generated from the received, crushed and screened coal as well as process. These coal fines are utilized for energy generation. Also, there will be generation of middlings in the washery which are also proposed for consumption in power generation. Char from the sponge iron kiln are third source of fuel for the power plant.

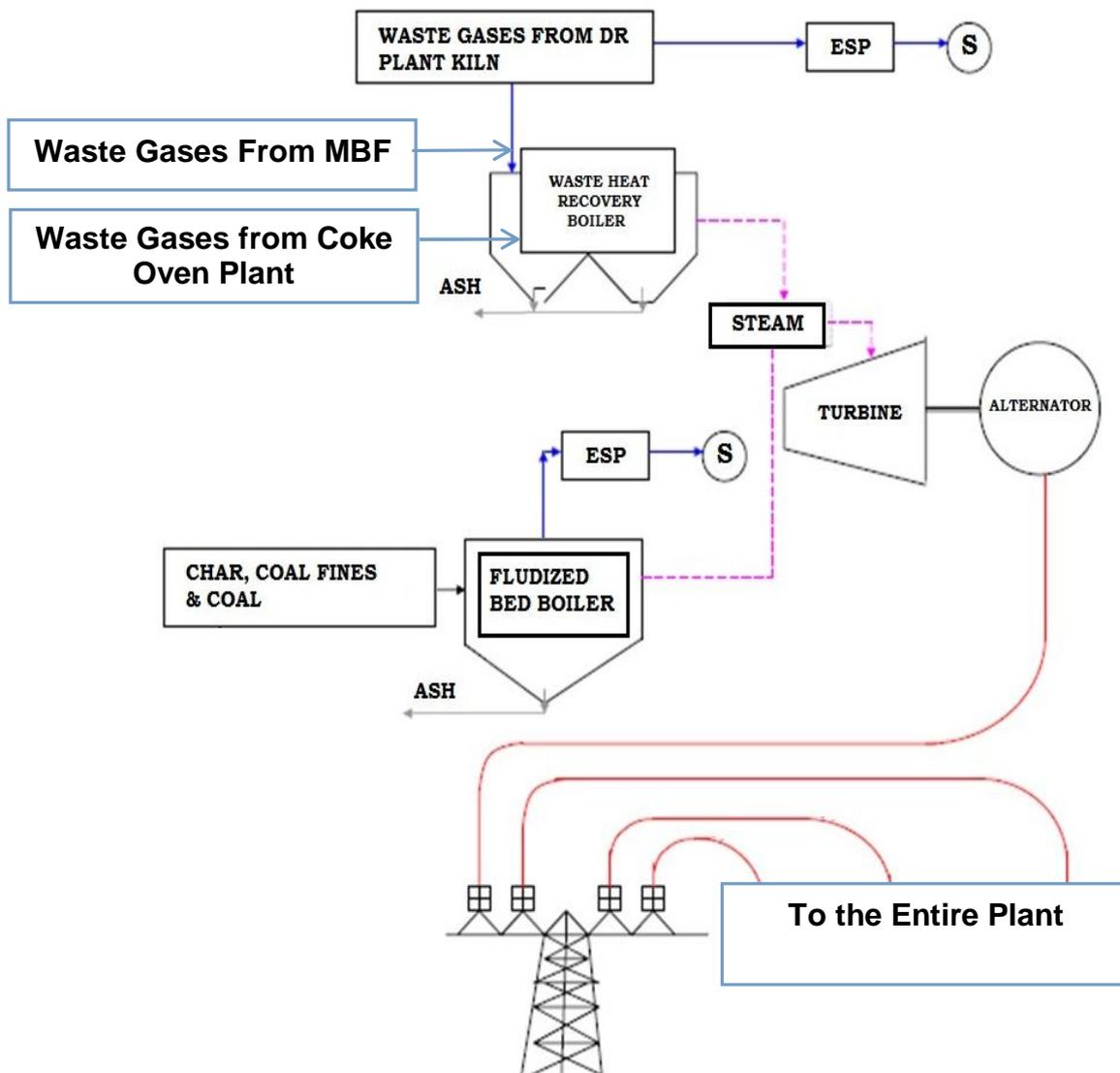
Ash handling system

For handling of fly ash of the steam generator, dense phase, pneumatic conveying system is provided. The ash collected in the hoppers located in economizer, air pre-heated sections of ESP hoppers will be pneumatically conveyed and collected. Ash will be utilize in manufacture Portland Pozzolana Cement (PPC) within plant premises, Brick manufacturing and Road making.

Cooling water system

Cooling water system is the main consumer of water in a thermal power plant. Cooling water is required for condenser and auxiliary cooling. The water required for condenser cooling should be soft water, free from suspended solids. A circulating water system with a cooling tower, make-up water system and blow down system shall be provided.

FIG 12: TYPICAL FLOW DIAGRAM OF POWER PLANT



3.5.15 Ferro Alloys Plant (54,000 TPA)

Submerged Arc Furnaces produce a wide range of metal products by smelting various minerals to metal products. In some processes a valuable slag or vapor product arise as well as metal.

In the submerged arc furnace electric power heats the raw materials and provides the energy to reduce the ore to a metallic state. Generally carbon serves as the reducing agent and fluxes are often added to facilitate the process. The common practice is to mix the ore materials, the reducing agent, and any fluxes outside of the furnace and then to periodically change this mixture (often called charge mix) into the furnace. Although the charge mix is added periodically, the reduction reactions and metal production proceed continuously. The metal is usually allowed to accumulate until tapping occurs at appropriate intervals; however continuous tapping is not uncommon.

The term “Submerged Arc” is used because the electrodes are usually buried deep in the furnace burden and the reduction reaction takes place near the tip of the electrodes. At the top of the burden little current flows between the electrodes because of the high resistivity of the un-melted charge. As the burden descends in the furnace the non-carbon portion of the charge begins to melt. As the carbon heats, its resistance decreases providing a conductivity path between the electrodes.

This current flow creates the intense heat needed for the high temperature and energy required for the reduction reactions. Due to the relatively low resistivity of most smelting process charge mixture, submerged arc furnaces generally operate at lower secondary voltages and higher currents than steelmaking furnaces. Depending on the size of the furnace and the resistivity of the charge mix, the secondary voltage will typically range between 160 to 280 volts in modern furnaces. The current can reach 200,000 amperes in the largest Furnaces. Since changes in the resistance are very slow in Submerged Arc Furnaces and the process are continuous, electric control is much simpler, and any disturbance to the electrical distribution network is much less severe than is the case with typical Electric Arc Furnace Steel production.

In this ferro alloys plant, slag process in submerged arc furnace will be adopted. The products to be made will be:

- Ferro-Silicon
- Ferro-Manganese
- Silico-Manganese
- Ferro-Chromium

Ferro-Silicon is widely used as a deoxidizer and alloying element in the Iron and steel industry. Most grades of Ferro-Silicon contain either 50% or 75% silicon by weight, commonly referred to as 50% FeSi and 75% FeSi. Silicon metal (usually > 99% Si purity) is primarily used as an alloying element in aluminum products and as a feedstock for the production of silicones.

A mixture of silica (usually quartz or quartzite), coke or coal, and wood chips makeup the charge mix. The coal or coke acts as the reducing agent and the wood chips improve charge porosity and resistivity. Iron usually in the form of light steel scrap, is added for ferrosilicon production.

The reaction to produce silicon metal is $\text{SiO}_2 + 2\text{C} \rightarrow \text{Si} + 2\text{CO}$.

However, there are complex side reactions that generate SiO gas and which burn to SiO and CO as they escape the burden. Successful operations keep the electrodes deeply buried so that the evolving SiO fume which is aerosol in nature exits the furnace through a hooding system and collects in baghouse filters. The collected fume is very light (9 to 12 lbs/ft³). If the fume is pure enough and handled correctly, it can be resold as an

additive to cement, ceramic, and refractory products. The unit configuration and material balance is given in **Table 45**.

**TABLE 45: TYPICAL OPERATING DATA FOR FERRO-SILICON PLANT
(AS SANCTIONED IN EC)**

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
A. Ferro-Silicon Smelting Unit					
1	Furnace Capacity (1X18 MVA + 1X9 MVA)	MVA	18	9	18 + 9
2	Power Factor		0.90	0.90	0.90
3	Total Power	MW	16.20	8.10	24.30
4	Working Hours in a Day	Hours	24	24	24
5	Working day in a Year	Days	320	320	320
6	Total Power in a Day	MW	388.8	194.4	583.2
7	Unit Required for 1T Production	KWH/T	8500	8500	8500
8	Furnace Efficiency		87.5%	87.5%	87.5%
9	Day Production	TPD	40.02	20.01	60.04
10	Annual Production	TPA	12,807.53	6,403.76	19,211.29
11	Say	TPA	19,800	6,400	19,200
B. Ferro-Silicon Smelting Material Balance					
Raw Material					
1	Quartz (94%-95%)	TPA	24,960	12,480	37,440
2	Charcoal / Coke	TPA	16,640	8,320	24,960
3	Iron Ore/ Mill Scale	TPA	3,200	1,600	4,800
4	Electrode Paste	TPA	896	448	1,344
5	Dolomite	TPA	896	448	1,344
	Sub-total	TPA	46,592	23,296	69,888
Product & By-Products					
1	Ferro-Silicon	TPA	12,800	6,400	19,200
2	Losses	TPA	33,792	16,896	50,688
	Sub-total	TPA	46,592	23,296	69,888

Ferro manganese and Silicon-Manganese:

Submerged arc furnace produce high-carbon or “standard” ferromanganese (typically 79% Mn and 7%C) and a silicon-manganese-Iron alloy commonly referred to as Silico-manganese. Silico-manganese typically contains 68 to

72% Mn, 15 to 23% Si, and 1 to 2% C. High-carbon ferromanganese can be refined to medium-carbon or low carbon ferro manganese in post tapping processes.

Manganese ores, which usually contain iron oxide, are mixed with coal or coke reductant and usually a small quantity of fluxes from the charge mix. Silico-manganese is produce by reprocessing high carbon ferromanganese by-product slag and smelting cheaper high silicon-manganese ores.

Modern Ferro-Manganese Furnace have a closed roof designed to prevent ambient air from mixing with the processes off- gas. The off-gas contain 65 to 70% CO and can be used as fuel for other plant processes such as raw material drying.

The raw material are premixed and then transported to overhead mix bins. From the overhead mix bin the mix drop through chutes which distribute the mix around the electrodes. The CO gas produce in the reaction zone pre-reduces the higher manganese oxide forms to MnO; however, gas reduction of MnO is impossible. The electric current passes through the coke bed and the slag layer and a reaction between the solid carbon reductant and the MnO occurs in the slag the coke layer minimizes arcing between the electrodes and the slag bath.

In order to reduce manganese vitalization, Ferro-Manganese producer operate at as low a temperature as possible while still keeping the slag fluid. The lower temperature limits the amount of MnO reduction; therefore the slag may contain up to 45% MnO and can be used as a raw material for the production of Silico-Manganese, Manganese chemicals or electrolytic manganese.

The electric resistance of the Ferro-Manganese mix is lower than it is for silicon alloys; therefore Ferro-Manganese Furnace operate at lower voltage and higher currents. **Table 46** and **Table 47** gives typical operating data for Manganese Alloys Furnaces.

TABLE 46: TYPICAL OPERATING DATA FOR SILICON-MANGANESE PLANT (AS SANCTIONED IN EC)

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
I	SILICO-MANGANESE PLANT				
A	Silico-Manganese Smelting Unit				
1	Furnace Capacity (1X18 MVA+ 1X 9 MVA)	MVA	18	9	18 + 9
2	Power Factor		0.90	0.90	0.90
3	Total Power	MW	16.20	8.10	24.30
4	Working Hours in a Day	Hours	24	24	24

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
5	Working Day in a Year	Days	320	320	320
6	Total Power in a Day	MW	389	194	583
7	Unit Required for 1T Production	KWH/T	3,950	3,950	3,950
8	Furnace Efficiency		91.5%	91.5%	91.5%
9	Day Production	TPD	90.06	45.03	135.10
	Annual Production	TPA	28,820	14,410	43,230
	Say	TPA	28,800	14,400	43,200
B	Silico-Manganese Smelting Material Balance				
	Raw Material				
1	Quartz (94%-95%)	TPA	4,320	2,160	6,480
2	Charcoal / Coke	TPA	13,824	6,912	20,736
3	Iron Ore / Mill Scale	TPA	360	180	540
4	Electrode Paste	TPA	720	360	1,080
5	Manganese Ore (38%-40%)	TPA	20,736	10,368	31,104
6	Low-Grade High Silicon Moil Ore	TPA	24,912	12,456	37,368
7	Fe-Mn Slag	TPA	20,736	10,368	31,104
8	Dolomite	TPA	2,882	1,441	4,323
9	Coal	TPA	6,624	3,312	9,936
	Sub total	TPA	95,114	47,557	142,671
	Product & By-Products				
1	Silico-Manganese	TPA	28,800	14,400	43,200
2	Losses	TPA	66,314	33,157	99,471
	Sub total	TPA	95,114	47,557	142,671

TABLE 47: TYPICAL OPERATING DATA FOR FERRO-MANGANESE PLANT (AS SANCTIONED IN EC)

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
1	Furnace Capacity (1X18 MVA+ 1X 9 MVA)	MVA	18.00	9.00	18 + 9
2	Power Factor		0.90	0.90	0.90
3	Total Power	MW	16.20	8.10	24.30
4	Working Hours in a Day	Hours	24	24	24
5	Working Day in a Year	Days	320	320	320

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
6	Total Power in a day	MW	388.80	194.40	583.20
7	Unit Required for 1T Production	KWH/T	3,100	3,100	3,100
8	Furnace Efficiency		89.7%	89.7%	89.7%
9	Day Production	TPD	112.50	56.25	168.75
10	Annual Production	TPA	36,000.37	18,000.19	54,000.56
11	Say	TPA	36,000	18,000	54,000
12	Briquette Required for 1T Production	T/T	2.00	2.00	2.00
13	Briquette required per Day	TPD	225.00	112.50	337.50
14	Capacity of Briquette Plant	TPH	9.38	4.69	14.06
15	Briquette Plant to be installed	TPH	9.50	5.00	14.50
B	Ferro-Manganese Smelting Material Balance				
	Raw Material				
1	Briquettes	TPA	74,240	37,120	111,360
2	Manganese Ore Lump	TPA	7,200	3,600	10,800
3	Coke	TPA	2,000	1,000	3,000
4	Quartz	TPA	2,196	1,098	3,294
5	Electrode Paste	TPA	792	396	1,188
	Sub total	TPA	86428	43214	129642
	Product & By-Products				
1	Ferro-Manganese (High Carbon Ferro-Manganese at 75 to 80% Mn)	TPA	36,000	18,000	54,000
2	Slag	TPA	43,214	21,607	64,821
3	Fines		7,214	3,607	10,821
	Sub total	TPA	86428	43214	129642
II	Briquetting Plant				
A	Ferro-Manganese Briquette Plant				
1	Capacity Of Briquette Plant	TPA			111,360
2	Unit Required for 1T Production	KWH/T			22

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
3	Total Power	MW			0.31
B	Briquette Plant Raw Material				
1	Manganese Concentrate Ore	TPA			100,224
2	Lime	TPA			4,454.4
3	Molasses	TPA			6,681.6
C	Product & By-Products				
1	Briquette	TPA			94,656
2	Reused Briquette Fines	TPA			16,704

Ferro chrome plant

When ferrochrome is produced by the reduction of chromite with carbon (coke) in submerged arc furnace, the product ferrochrome so obtained is basically carbon saturated iron-chromium alloy with typically 6-8-wt %.- C. In solid ferrochrome carbon forms solid chromium carbide and complex iron-chromium carbides.

TABLE 48: TYPICAL OPERATING DATA FOR FERRO-CHROME (AS SANCTIONED IN EC)

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
1	Furnace Capacity	MVA	18	9	18 + 9
2	Power Factor		0.90	0.90	0.90
3	Total Power	MW	16.20	8.10	24.30
4	Working Hours in a Day	Hours	24	24	24
5	Working Day in a Year	Days	320	320	320
6	Total Power in a day	MW	388.8	194.4	583.20
7	Unit required for 1T Production	KWH/T	3,950	3,950	3,950
8	Furnace Efficiency		91.5%	91.5%	91.5%
9	Day Production	TPD	90.06	45.03	135.10
10	Annual Production	TPA	28,820.42	14,410.21	43,230.62
11	say	TPA	28,800	14,400	43,200
12	Briquette required for 1T Production	T/T	2.00	2.00	2.00
13	Briquette required per day	TPD	180.13	90.06	270.19
14	Capacity of Briquette Plant	TPH	7.51	3.75	11.26
15	Briquette plant to be installed	TPH	7.50	4.00	11.50

Sl. No.	Description	Unit	Furnace-1	Furnace-2	Total
B	Ferro-Chrome smelting material balance				
	Raw material				
1	Briquettes	TPA	58,880	29,440	88,320
2	Chrome Ore Lump	TPA	5,764	2,882	8,646
3	Coke (400kg/fc)	TPA	1,601	801	2,402
4	Quartz	TPA	1,758	879	2,637
5	Electrode Paste	TPA	634	317	951
	Sub-Total	TPA	68637	34319	102956
	Product & By-Products				
1	Ferro-Chrome	TPA	28,820	14,410	43,231
2	Slag	TPA	34,319	17,159	51,478
3	Fines		5,498	2,749	8,247
	Sub-Total	TPA	68637	34319	102956
II	Briquetting Plant				
A	Ferro-Chrome Briquette Plant				
1	Capacity Of Briquette Plant	TPA			88,320
2	Unit Required For 1T Production	KWH/T			22
3	Total Power	MW			0.25
B	Briquette Plant Raw Material				
1	Chome-ore concentrate	TPA			79,488
2	Lime	TPA			3,532.8
3	Molasses	TPA			5,299.2
C	Product & By-Products				
1	Briquette	TPA			75,072
2	Reused Briquette Fines	TPA			13,248

3.6 Raw material required along with estimated quantity, likely source, marketing area of final product's mode of transport of raw material and finished product

The unit wise detail of raw material is given in **Table 49** and consolidated list of raw material with their sources are given in **Table 50**. The finished product details are given in **Table 51**.

TABLE 49: UNIT WISE DETAIL OF RAW MATERIAL REQUIREMENT IN TPA

Sl. No.	Facilities	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse	Outhouse
1	Pellet plant	Iron Ore/ concentrate/dust	TPA	28,000,000	0	28,000,000	600,900	27,399,100
		Fines/	TPA					
		Dolomite (Flux)	TPA	625,000	0	625,000	0	625,000
		Bentonite	TPA	250,000	0	250,000	0	250,000
		Coke Breeze	TPA	500,000	0	500,000	0	500,000
		Coal (for emergency)	TPA	1,000,000	0	1,000,000	0	1,000,000
2	Coal Washery	ROM coal	TPA	1,260,000	0	1,260,000	0	1,260,000
3	Sponge Iron Plant	Iron Ore/Iron Oxide	TPA	3,776,490	2,629,476	6,405,966	6,405,966	0
		Coal	TPA	2,289,750	1,594,296	3,884,046	2,070,480	1,813,566
		Dolomite	TPA	116,369	81,025	197,394	0	197,394
4	MBF	Iron Ore	TPA	297,281	219,336	516,617	0	516,617
		Pellet	TPA	375,226	219,336	594,562	594,562	0
		Sinter	TPA	1,981,907	4,653,000	6,634,907	6,634,907	0
		Coke	TPA	766,295	1,162,350	1,928,645	1,928,645	0
		Coal Dust	TPA	186,657	387,450	574,107	0	574,107
		Dolomite	TPA	217,006	361,620	578,626	0	578,626
		Quartz	TPA	79,685	134,316	214,001	0	214,001
5	Sinter Plant	Iron Ore Fines	TPA	1,733,225	3,955,050	5,688,275	0	5,688,275
		Coke Fines	TPA	184,222	465,300	649,522	636,395	13,127
		Lime Stone	TPA	286,510	465,300	751,810	0	751,810
		Dolomite	TPA	219,982	465,300	685,282	0	685,282
		Iron ore fines from pellet	TPA	600,900	-600,900	0	0	0
		sinter return	TPA	614,772	1,395,900	2,010,672	2,010,672	0
		ESP, BF dust	TPA	194,000	135,077	329,077	329,077	0

Sl. No.	Facilities	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse	Outhouse
		Dust from MBF	TPA	77,502	152,075	229,577	229,577	0
		Bag filter dust from coke oven	TPA	41,223	76,104	117,327	117,327	0
		BF dust from IF	TPA	49,682	27,270	76,951	76,951	0
		BF dust from EAF	TPA	19,567	68,586	88,153	88,153	0
		Mill Scale	TPA	114,539	127,521	242,060	242,060	0
		Fines from ferro alloy plant	TPA	10,821	0	10,821	10,821	0
6	Coke Oven	Coking Coal	TPA	1,374,100	2,536,800	3,910,900	0	3,910,900
7	SMS							
7.1	I.F.	DRI	TPA	1,990,404	1,120,000	3,110,404	3,110,404	0
		Pig Iron / Hot Metal	TPA	349,039	182,609	531,647	531,647	0
		Steel Scrap	TPA	116,277	60,870	177,147	113,880	63,267
	IF (CCM)	Liquid Metal from Furnace	TPA	2,040,500	1,120,000	3,160,500	3,160,500	0
7.2	EAF	DRI	TPA	431,325	583,023	1,014,348	1,014,348	0
		Hot Metal/ Pig Iron from MBF	TPA	547,003	2,846,289	3,393,292	3,393,292	0
		Lime	TPA	167,046	462,000	629,046	629,046	0
	EAF (CCM)	Liquid Metal from Furnace	TPA	840,000	3,018,000	3,858,000	3,858,000	0
8.1	Rolling Mill	Semi-Finished Product from IF-CCM	TPA	1,999,690	0	1,999,690	1,999,690	0
		Semi finished from EAF/BOF/EOF/ NOF	TPA	618,556	0	618,556	618,556	0
		Furnace Oil @17l/T	TPA	39,537	0	39,537	0	39,537
8.2	Strip Mill	Semi Finished Product from CCM	TPA	204,644	0	204,644	204,644	0
		Furnace Oil @50l/T	TPA	9,200	0	9,200	0	9,200
8.3	Ductile Pipe	Hot Metal from Blast Furnace	TPA	510,204	0	510,204	510,204	0

Sl. No.	Facilities	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse	Outhouse
		Furnace Oil @50l/T	TPA	23,000	0	23,000	0	23,000
8.4	Rolling Mills	Semi-finished product from IF	TPA	0	1,108,800	1,108,800	1,108,800	0
		Semi-finished product from EAF	TPA	0	2,987,820	2,987,820	2,987,820	0
		Furnace Oil @32l/T			115,994	115,994	0	115,994
9	Ferro Alloy Plant							
9.1	Ferro-Silicon Plant	Quartz	TPA	37,440	0	37,440	0	37,440
		Charcoal / Coke	TPA	24,960	0	24,960	0	24,960
		Iron Ore/ Mill Scale	TPA	4,800	0	4,800	4,800	0
		Electrode Paste	TPA	1,344	0	1,344		1,344
		Dolomite	TPA	1,344	0	1,344	0	1,344
9.2	Ferro-Manganese	Briquettes	TPA	111,360	0	111,360	111,360	0
		Manganese Ore Lump	TPA	10,800	0	10,800	0	10,800
		Coke	TPA	3,000	0	3,000	0	3,000
		Quartz	TPA	3,294	0	3,294	0	3,294
		Electrode Paste	TPA	1,188	0	1,188	0	1,188
9.2.1	Ferro-Manganese Briquette plant	Manganese Ore Concentrate	TPA	100,224		100,224	0	100,224
		Lime	TPA	4,454		4,454	4,454	0
		Molasses	TPA	6,682		6,682		6,682
9.3	Ferro chrome	Briquettes	TPA	88,320	0	88,320	88,320	0
		Chrome Ore Lump	TPA	8,646	0	8,646		8,646
		Coke	TPA	2,402	0	2,402	0	2,402
		Quartz	TPA	2,637	0	2,637	0	2,637
		Electrode Paste	TPA	951	0	951	0	951

Sl. No.	Facilities	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse	Outhouse
9.3.1	Ferro chrome Briquette Plant	Chrome ore Concentrate	TPA	79,488	0	79,488	0	79,488
		Lime	TPA	3,533	0	3,533	3,533	0
		Molasses	TPA	5,299	0	5,299	0	5,299
9.4	Silico-Manganese	Quartz	TPA	6,480	0	6,480	0	6,480
		Charcoal / Coke	TPA	20,736	0	20,736	0	20,736
		Iron Ore / Mill Scale	TPA	540	0	540	540	0
		Electrode Paste	TPA	1,080	0	1,080	0	1,080
		Manganese Ore	TPA	31,104	0	31,104	0	31,104
		Low-Grade High Silicon Moil Ore	TPA	37,368	0	37,368	0	37,368
		Fe-Mn Slag	TPA	31,104	0	31,104	31,104	0
		Dolomite	TPA	4,323	0	4,323	0	4,323
		Coal	TPA	9,936	0	9,936	0	9,936
		10	Producer Gas Plant	Coal	TPA	1,654,442	0	1,654,442
11	Power Plant	Middlings	TPA	508,725	0	508,725	508,725	0
		Char	TPA	504,020	385,961	889,981	889,981	0
		Coal (purchased)	TPA	1,442,918	762,341	2,205,259	0	2,205,259
		Coal fines	TPA	267,153	0	267,153	0	267,153
		Lime stone	TPA	33,600	14,625	48,225	0	48,225
12	Cement Plant	(i) PBFS Cement						
		Slag Generation from Blast Furnace	TPA	301,526	938,388	1,239,914	1,239,914	0
		Slag Generation from Previous Blast furnace	TPA	123,795	0	123,795	123,795	0

Sl. No.	Facilities	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse	Outhouse
		Clinker	TPA	536,716	0	536,716	0	536,716
		Gypsum	TPA	51,690	45,718	97,408	0	97,408
		Coal (For Drying)	TPA	30,000	29,123	59,123	0	59,123
		(ii) PPC						
		Fly Ash from Middlings & Char	TPA	447,818	142,099	589,917	589,917	0
		Clinker	TPA	1,253,891	397,876	1,651,768	0	1,651,768
		Gypsum	TPA	89,564	28,419	117,983	0	117,983
13	Lime Plant	Lime Stone	TPA	308,700	831,600	1,140,300	0	1,140,300
		Fuel Oil	TPA	34,300	92,400	126,700	0	126,700
		Total *		65,211,226	37,985,542	103,196,768	48,721,373	54,475,395

** Highest of Ferro alloy is considered*

TABLE 50: CONSOLIDATED RAW MATERIAL REQUIREMENT (IN TPA) AND THEIR SOURCES

Sl.	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	In-house	Out-house	Source	Distance (kms)	Mode of transportation
1	Bag Filter and ESP Dust	TPA	381,973	459,112	841,085	841,085	0	Inhouse	0	Internal
2	Bentonite	TPA	250,000	0	250,000	0	250,000	Gujarat	900	By Rail/Road
3	Briquettes	TPA	111,360	0	111,360	111,360	0	Inhouse	0	Internal
4	Char	TPA	504,020	385,961	889,981	889,981	0	Inhouse	0	Internal
5	Chrome Ore Lump and Concentrate	TPA	88,134	0	88,134	0	88,134	Odisha	200	By Road
6	Clinker	TPA	1,790,607	397,876	2,188,483	0	2,188,483	Rourkela, Odisha	200	By Road
7	Coal and fines	TPA	8,140,856	2,773,210	10,914,066	2,070,480	8,843,586	Imported, Odisha	300	By Rail/Road
8	Coking Coal	TPA	1,374,100	2,536,800	3,910,900	0	3,910,900	South Africa/ Talcher	300	By Rail/Road
9	Coke, Coke breeze and fines	TPA	1,475,477	1,627,650	3,103,127	2,565,040	538,087	Imported, Rourkela in Odisha	200	By Rail/Road
10	Dolomite	TPA	1,182,680	907,945	2,090,625	0	2,090,625	Rourkela, Odisha	200	By Road
11	DRI	TPA	2,421,729	1,703,023	4,124,752	4,124,752	0	Inhouse	0	Internal
12	Electrode Paste	TPA	1,344	0	1,344	0	1,344	Jamshedpur	60	By Road
13	Fe-Mn Slag	TPA	31,104	0	31,104	31,104	0	Inhouse	0	Internal
14	Fines from ferro alloy plant	TPA	10,821	0	10,821	10,821	0	Inhouse	0	Internal
15	Fly Ash from Middlings & Char	TPA	447,818	142,099	589,917	589,917	0	Inhouse	0	Internal
16	Fuel and Furnace Oil	TPA	106,037	208,394	314,431	0	314,431	Ranchi, Jharkhand	170	By Road
17	Gypsum	TPA	141,254	74,137	215,391	0	215,391	Rourkela, Odisha	200	By Road
18	Hot Metal/ Pig Iron	TPA	1,406,245	3,028,898	4,435,143	4,435,143	0	Inhouse	0	Internal
19	Iron ore, fines and concentrate	TPA	34,412,696	6,202,962	40,615,658	7,011,666	33,603,992	OMC /other pvt mines	110	By Rail/ Road
20	Lime	TPA	171,500	462,000	633,500	633,500	0	Inhouse	0	Internal
21	Lime Stone	TPA	628,810	1,311,525	1,940,335	0	1,940,335	Rourkela, Odisha	200	By Road

Sl.	Raw Material	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	In-house	Out-house	Source	Distance (kms)	Mode of transportation
22	Liquid Metal	TPA	2,880,500	4,138,000	7,018,500	7,018,500	0	Inhouse	0	Internal
23	Low-Grade High Silicon Moil Ore	TPA	37,368	0	37,368	0	37,368	Odisha	120	By Road
24	Mn Ore and Concentrate	TPA	131,328	0	131,328	0	131,328	Koida, Odisha	110	By Rail/ Road
25	Middlings	TPA	508,725	0	508,725	508,725	0	Inhouse	0	Internal
26	Mill Scale	TPA	114,539	127,521	242,060	242,060	0	Inhouse	0	Internal
27	Molasses	TPA	6,682	0	6,682	0	6,682	Tatanagar	60	By Road
28	Pellet	TPA	375,226	219,336	594,562	594,562	0	Inhouse	0	Internal
29	Quartz	TPA	117,125	134,316	251,441	0	251,441	Rourkela, Odisha	200	By Road
30	Semi-Finished product	TPA	2,822,890	4,096,620	6,919,510	6,919,510	0	Inhouse	0	Internal
31	Sinter	TPA	1,981,907	4,653,000	6,634,907	6,634,907	0	Inhouse	0	Internal
32	Sinter return	TPA	614,772	1,395,900	2,010,672	2,010,672	0	Inhouse	0	Internal
33	Slag from Blast furnace	TPA	425,321	938,388	1,363,709	1,363,709	0	Inhouse	0	Internal
34	Steel Scrap	TPA	116,277	60,870	177,147	113,880	63,267	Imported/ Jamshedpur	60	By Road
	Total*	TPA	65,211,226	37,985,542	103,196,768	48,721,373	54,475,395			

* Highest of Ferro alloy is considered

TABLE 51: FINISHED PRODUCT DETAILS FOR ENTIRE 7.0185 MTPA PLANT, TPA

Sl. No.	Unit	Product	Unit	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Consumed Inhouse	Out for Sale
1	Pellet plant	Pellets	TPA	25,000,000	0	25,000,000	7,000,528	17,999,472
2	Coal Washery	Washed coal	TPA	2,070,480	0	2,070,480	2,070,480	0
3	Sponge iron plant	DRI	TPA	2,477,900	1,725,300	4,203,200	4,124,752	78,448
4	MBF	Hot Metal	TPA	1,550,045	3,041,500	4,591,545	4,435,143	156,402
5	Sinter Plant	Sinter Ore	TPA	2,101,572	4,653,000	6,754,572	6,634,907	119,665
6	Coke Oven	Coke	TPA	910,000	1,680,000	2,590,000	2,590,000	0
7	SMS-IF	Liquid metal to CCM	TPA	2040500	1,120,000	3,160,500	3,160,500	0
8	SMS-IF-CCM	Semi-Finished Product from CCM	TPA	1,999,690	1,108,800	3,108,490	3,108,490	0
9	SMS-EAF	Liquid metal to CCM	TPA	840000	3,018,000	3,858,000	3,858,000	0
10	SMS-EAF/ BOF/ NOF/ EOF -CCM	Semi-Finished Product from CCM	TPA	823,200	2,987,820	3,811,020	3,811,020	0
11	Rolling Mill	Finished Product	TPA	2,527,964	0	2,527,964	0	2,527,964
12	Strip Mill	Finished Product	TPA	200,000	0	200,000	0	200,000
13	Ductile Pipe	Finished Product	TPA	500,000	0	500,000	0	500,000
14	Rolling Mill	Finished Product	TPA	0	3,940,000	3,940,000	0	3,940,000
15	Ferro-Silicon Plant	Ferro-Silicon	TPA	19,200	0	19,200	0	19,200
16	Ferro-Manganese	Ferro-Manganese	TPA	54,000	0	54,000	0	54,000
17	Ferro-Manganese Briquette plant	Briquettes	TPA	111,360		111,360	111,360	0
18	Ferro chrome	Ferro Chrome	TPA	43,231	0	43,231	0	43,231
19	Ferro chrome Briquette Plant	Briquettes	TPA	88,320		88,320	88,320	
20	Silico-Manganese	Silico-Manganese	TPA	43,200	0	43,200	0	43,200
21	Cement Plant	Cement	TPA	2,805,000	1,552,500	4,357,500	0	4,357,500
22	Lime Plant	Lime	TPA	171,500	462,000	633,500	633,500	0
	Total*			46,183,211	21,348,920	67,532,131	41,538,680	25,993,451

* Highest of Ferro alloy is considered

Mode of transport of Raw material

Raw material will be transport through Rail/ Road. Presently raw material is being transport by Rail/ Road.

3.7 Resource optimization/ recycling and reuse envisaged in the project

Recirculating cooling water system is & shall be provided in the plant. The recirculating cooling water pumps to the various consumers in the plant is/ will pump cold water from the cooling tower basin.

The hot water return from the consumers will return to the cooling tower for cooling and recirculation.

To meet the requirement of demineralization water as make-up water for boiler, de-mineralization plant of suitable capacity is/ will be provided. Water quality shall meet the Turbine and Boiler Manufacturers' recommendation.

Entire waste water from complex is/ shall be treated and reused for afforestation, green belt watering, sprinkling and dust suppression. There shall be no liquid waste discharge from the Plant premises except during monsoon when the sprinkling and watering demand will be almost negligible. Domestic waste shall be generated from the plant office, organic component of which shall be composted/ vermi composted. The sewage from the Plant shall be led to Sewage Treatment Plant. It will be provided with biological treatment facility to control BOD and suspended solids.

The treated effluent conforming to prescribed standards will continued to be used for watering plantation. Wastes such as used oils/ spent oil shall be generated periodically, which shall be sold to authorized recycling vendors in drums.

3.8 Availability of water its source, energy / power requirement and source

Existing: Fresh water requirement for 2.8805 MTPA complex, under envisaged operating conditions, is estimated 4,200 KLH. The permission for withdrawal of 640 KLH has been granted by the State Government from Kharkai river while 3,560 KLH has been applied for.

Proposed: The water required for the plant shall be sourced from Kharkai river and rain water harvesting. Total water requirement for the proposed expansion shall be 2,466 KLH.

The total fresh water requirement for the entire 7.0185 MTPA project will be 6,666 KLH. Daily make up water requirement has been given in **Table 52**.

The plant will generate 1,252 MW energy in form of electricity from its captive power plant and will utilize the total power generated in its existing as well as proposed Steel plant. Energy consumption is given in **Table 53**.

TABLE 52: WATER REQUIREMENT FOR ENTIRE 7.0185 MTPA PLANT (KLH)

Plant	Unit	As per EC dated 19.01.2021				Proposed Additional				Total After Expansion			
		Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water	Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water	Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water
Pellet Plant	TPA	25000000	940.9	791.9	149					25000000	940.9	791.9	149
Coal Washery	TPA	1260000	21	2	19					1260000	21	2	19
Sponge Iron Plant	TPA	2477900	343.08	343.08		1725300	162	162.00	0	4203200	505.08	505.08	0
Mini Blast Furnace	TPA	1550045	158.58	95.58	63	3041500	290	174.79	115.21	4591545	448.58	270.37	178.21
Sinter Plant	TPA	2101572	69.84	64.66	5.18	4653000	176	162.95	13.05	6754572	245.84	227.61	18.23
Coke Oven	TPA	910000	79.39	79.39		1680000	60	60.00	0.00	2590000	139.39	139.39	0
SMS (I.F./L.R.F.-CCM)	TPA	2040500	188.14	184.24	3.9	1120000	107	104.78	2.22	3160500	295.14	289.02	6.12
SMS (BOF/ NOF/ EOF/ EAF-LRF-VD/ RH/ AOD)		840000	80	78	2	3018000	305	297.38	7.63	3858000	385	375.38	9.63
TMT/Flat/ Round/ Wire/ Rod/ Structural Mill	TPA	2527964	329.37	324.97	4.4	4390000	532	524.89	7.11	6917964	861.37	849.86	11.51
Strip Mill	TPA	200000	23	22	1					200000	23	22	1
Ductile Pipe	TPA	500000	57	55	2					500000	57	55	2
Color coated/ Galvanized/ pipe	TPA					700000	85	82.02	2.98	700000	85	82.01754386	2.98245614
Producer Gas Plant	CUM/hr	661000	152	11.65	140.35					661000	152	11.65	140.35
Ferro Alloy Plant										0	0	0	0
Ferro-Chrome or	TPA	43200								43200	0	0	0
Ferro-Manganese or	TPA	108000	39	39						108000	39	39	0
Ferro-Silicon or	TPA	19200								19200	0	0	0
Silico-Manganese	TPA	43200								43200	0	0	0

Plant	Unit	As per EC dated 19.01.2021				Proposed Additional				Total After Expansion			
		Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water	Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water	Capacity	Fresh/Make-up Water	Evaporation/Consumed water	Discharge/Waste Water
Briquette Plant for Ferro Alloys		0								0	0	0	0
Captive Power Plant		0								0	0	0	0
Power using Water and Air Cooled Condensor	MW	657	1454.2	1383	71.2	560	560	532.58	27.42	1217	2014.2	1915.58	98.62
Oxygen Plant	cum/annum	161700000	3.69	3.69	0	588000000	16	16.00	0.00	749700000	19.69	19.69	0
Lime Plant	TPA	171500	8.33	8.33	0	462000	29	29.00	0.00	633500	37.33	37.33	0
Cement Plant	TPA	2805000	177	177	0	1552500	94	94.00	0.00	4357500	271	271	0
Misc		0	6.93	6.93	0		34	34.00	0.00	0	40.93	40.93	0
Drinking Water		0	69.5	6.95	62.55		16	1.60	14.40	0	85.5	8.55	76.95
GRAND TOTAL			4200.95	3677.37	523.58		2466	2275.99	190.01	0	6666.95	5953.36	713.59
Say			4200	3677	523		2466	2245	190	0	6666	5922	713

TABLE 53: ENERGY CONSUMPTION FOR ENTIRE 7.0185 MTPA PLANT

Plant	Unit	As per EC dated 19.01.2021				Proposed Additional				Total			
		Capacity	Unit Req.	No. of Working	Connecte d	Capacity	Unit Req.	No. of Working	Connected	Capacity	Unit Req.	No. of Working	Connected
				Days & Hours	Load in MW			Days & Hours	Load in MW			Days & Hours	Load in MW
Pellet Plant	TPA	25000000	50	330,345&24	158.82	0	0	0	0	25000000	50	330,345&24	158.82
Coal Washary	TPA	1260000	13	300 & 24	2.25	0	0	0	0	1260000	13	300 & 24	2.25
Sponge Iron Plant	TPA	2477900	63	355 & 24	18.21	1725300	80	355 & 24	16.2	4203200	63-80	355 & 24	34.41
Mini Blast Furnace	TPA	1550045	136	350 & 24	25.08	3041500	150	350 & 24	54.31	4591545	136-150	350 & 24	79.39
Sinter Plant	TPA	2101572	44	330 & 24	11.72	4653000	45	330 & 24	26.44	6754572	44-45	330 & 24	38.16
Coke Oven	TPA	910000	10	350 & 24	1.08	1680000	10	350 & 24	2	2590000	10	350 & 24	3.08
SMS (I.F.-L.R.F.)	TPA	2040500	727	350 & 24	176.71	1120000	725	350 & 24	96.67	3160500	725-727	350 & 24	273.38
SMS (BOF/ NOF/ EOF/ EAF-LRF-VD/ RH/ AOD)	TPA	840000	600	350 & 24	60	3018000	100	330 & 24	38.11	3858000	100-600	330, 350 & 24	98.11
CCM	TPA	2859710	100	350 & 24	34.05	4096620	100	330 & 24	51.73	6956330	100	330, 350 & 24	85.78
TMT/Flat/ Round/ Wire/ Rod/ Structural Mill	TPA	2527964	125	350 & 20	45.09	4390000	300	330 & 20	166.29	6917964	125-300	330, 350 & 20	211.38
Ductile pipe	TPA	500000	400	350&20	28.57	0				500000	400	350&20	28.57
Strip mill	TPA	200000	130	350&20	3.71	0				200000	130	350&20	3.71
Colour Coated/ Galvanised/ Pipe						700000	200	330 & 20	17.68	700000	200	330 & 20	17.68
Oxygen Plant	CUM	169050000	0	350 & 24	8.9	58800000	0.5	350 & 24	35	757050000	0.5	350 & 24	43.9
Lime Plant	TPA	171500	1	350 & 24	0.02	462000	1	330 & 24	0.05	633500	1	330, 350 & 24	0.07
Producer Gas Plant	CUM/hr	661000	0.020	330 & 24	13.22	0				661000	0.020	330 & 24	13.22
Cement plant	TPA	2805000	25	330&24	8.85	1552500	30	345&24	5.63	4357500	25-30	330,345&24	14.48
Miscellanous					2					0			2
SUB TOTAL		0			598.28				510.11	0			1108.39
Ferro Alloy Plant		0			0	0				0			0
Ferro-Chrome or	TPA	43200	3950	320 & 24	22.21875	0				43200			22.21875
Ferro-Manganese or	TPA	54000	3100	320 & 24	21.796875	0				54000			21.796875

Plant	Unit	As per EC dated 19.01.2021				Proposed Additional				Total			
		Capacity	Unit Req.	No. of Working	Connecte d	Capacity	Unit Req.	No. of Working	Connected	Capacity	Unit Req.	No. of Working	Connected
				Days & Hours	Load in MW			Days & Hours	Load in MW			Days & Hours	Load in MW
Ferro-Silicon or	TPA	19200	8500	320 & 24	21.25	0				19200			21.25
Silico-Manganese	TPA	43200	3950	320 & 24	22.21875	0				43200			22.21875
Briquette Plant										0			0
Briquette Plant for Ferro Chrome or	TPA	88320	22	320 & 24	0.253	0				88320			0.253
Briquette Plant for Ferro Manganese TPH	TPA	111360	22	320 & 24	0.319	0				111360			0.319
TOTAL LOAD*	MW				620.50				510.11	0			1130.61
TOTAL LOAD	MW	0			621				510				1131
Power Generation	MW	0			657				595				1252
Power Plant Station Load	MW	0			58				63				121
Power Available for utilization	MW	0			599				532				1131
Power from Grid		0			22				Not required since excess 22				0

* Highest of Ferro alloy is considered

3.9 Quantity of wastes likely to be generated (liquid and solid) and scheme for their management /disposal

The main solid waste generated will be Char from DRI plant, slag from blast furnace and ash from CPP in expansion phase. Electrostatic Precipitator and Bag Filters Systems shall be installed in all proposed stacks for pollution control of air emissions. Wastes like slag, runners & raiser from SMS and scales and return scrap etc. from Rolling Mill will be recycled and reused in the process. Domestic waste shall be generated from the plant office, organic component of which shall be composted/ vermi composted. Quantities of waste generation are given in **Table 54**.

TABLE 54: SOLID WASTE GENERATION AND MANAGEMENT (TPA)

Sl. No.	Source	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse reuse	Outhouse reuse/ sale	Remarks
	DRI Plant						
1	Char	524,668	365,313	889,981	889,981	0	100% Char will be used for power generation
2	ESP, Bag Filter Dust	194,000	135,077	329,077	329,077	0	100% dust will be used in Sinter Plant
3	Kiln accretion	49,225	34,274	83,499	16,700	66,799	100% Stored in in land fill temporarily till reused in road sub-base making within and outside plant
	Pelletisation Plant						
1	Dust	600,900	0	600,900	600,900	0	100% dust will be reused in Pellet Plant.
	Coal Washery						
1	Middlings	535,000	0	535,000	535,000	0	508725 used in CPP and 26275 as material handling losses
2	Rejects	95,000	0	95,000	0	95,000	100% temporarily stored in solid waste disposal area within project site till sent for backfilling in mine or used for road making/ filling of low lying area
	Mini Blast Furnace						
1	BF Slag	451,259	912,450	1,363,709	1,363,709	0	100% slag will be granulated, used for cement making in own proposed cement plant.

Sl. No.	Source	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse reuse	Outhouse reuse/ sale	Remarks
2	Dust	77,502	152,075	229,577	229,577	0	100% dust will be reused in Sinter Plant.
	Sinter Plant						
1	Sinter Return	614,772	1,395,900	2,010,672	2,010,672	0	100% reused in sinter plant
	Coke Oven plant						
1	Bag Filter Dust	41,223	76,104	117,327	117,327	0	100% reused in sinter plant
	SMS-IF						
1	BF dust	49,682	27,270	76,951	76,951	0	100% reused in sinter plant
2	Slag	365,538	216,209	581,747	58,175	523,572	100% slag will be given for metal recovery, converted to aggregates (special balls) and used in road making within and outside plant
	SMS-IF-CCM						
1	Mill Scale	40,810	11,200	52,010	52,010	0	100% reused in sinter plant
	SMS-EAF						
1	BF dust	19,567	68,586	88,153	88,153	0	100% reused in sinter plant
2	Slag	252,398	712,326	964,724	0	964,724	100% used in road making, filler in embankment and new development show success in use for ceramic tiles production and cement making
	SMS-EAF-CCM						
1	Mill scale	16,800	30,180	46,980	46,980	0	100% reused in sinter plant
	Rolling Mill						
1	Reject	36,719	0	36,719	36,719	0	100% reused in SMS
2	Mill Scale	53,563	0	53,563	53,563	0	100% reused in sinter plant
	Strip Mill						
1	Reject	2,090	0	2,090	2,090	0	100% reused in SMS
2	Mill Scale	2,554	0	2,554	2,554	0	100% reused in sinter plant

Sl. No.	Source	As per EC dated 19.01.2021	Proposed additional	Total after Expansion	Inhouse reuse	Outhouse reuse/ sale	Remarks
	Ductile pipe						
1	Reject	4,592	0	4,592	4,592	0	100% reused in SMS
2	Mill Scale	5,612	0	5,612	5,612	0	100% reused in sinter plant
	Rolling Mill						
1	Reject		70,479	70,479	70,479	0	100% reused in SMS
2	Mill Scale		86,141	86,141	86,141	0	100% reused in sinter plant
	Producer gas plant						
1	Coal Ash	415,397	0	415,397	0	415,397	100% reused as per Fly ash utilisation notification 1999 and its amendments of 2003, 2009, 2016. Used in cement making, brick making, block making, aggregate making, and road making.
2	Coal Tar	69,987	0	69,987	0	69,987	Sale
	Power Plant			0			
1	Ash	1,293,546	594,520	1,888,066	589,917	1,298,149	100% reused as per Fly ash utilisation notification 1999 and its amendments of 2003, 2009, 2016. Used in own cement plant (589,917 TPA) and rest sent to cement making, brick making, block making, aggregate making, and road making.
	Ferro Alloys Plant	0		0			
1	Fe-Mn Slag	64,821	0	64,821	31,104	33,717	Used in Ferro alloy plant and balance for sale
2	Fines	10,821	0	10,821	10,821	0	100% Reused in sinter plant
	Total	5,888,044	4,888,103	10,776,147	7,308,803	3,467,344	

3.10 Schematic Representations of the Feasibility drawing which give information of EIA purpose

Environmental clearance has been obtained by MOEF&CC vide letter no J-11011/305/2012.IA.II(I) dated 19.01.2021. Process flow sheets have been given respective sections describing the processes. The layout plant has been uploaded in **Additional Attachment of Form 1**.

4.0 SITE ANALYSIS

4.1 Connectivity

The plant is accessible by all weather roads from the district head quarter Saraikela, which is located at a distance of 14 km by road in NNE and DC office is located at a distance of 7 km in SW. The nearest railway station is Chaibasa, on Raj Kharswan-Padapar Section of SE Railway, and is about 7 km by road from the site in West direction. The nearest airport is at Ranchi, which is at a distance of 150 km by road from the site in North-west direction.

4.2 Land form, land use and land ownership

449.09 acres land is additionally required which consists of 328.64 acres is private land and 120.45 acres is government land.

4.3 Topography

The ground elevation of the project area (including existing & expansion area) varies from 185 to 208 m amsl, as per google earth elevation accessed on 12.07.2021. The ground elevation of the 10 km study area varies from 165 m amsl near Titirbila village to 498 m amsl near Gobraboru Pahar PF. There are various hills in the study area and the hill on the eastern side of the plant reaches an elevation of 358 m AMSL.

4.4 Existing land use pattern

Same as per point 4.2

There are no National parks, Wildlife Sanctuary, Biospheres reserves within 15 km radius. The nearest Wildlife Sanctuary is Dalma Sanctuary at a distance of 33 km in NE. The nearest National Park is Simlipal National park at a distance of 66 km in SE direction and its ESZ is at a distance of 51 km in SE. There are several water bodies and forest present within the study area of the project. The distance to various water bodies, forest, etc. are given in **Table 5** earlier.

4.5 Existing infrastructure

New supporting infrastructure like office building, canteen, strengthening of roads, waste or waste water treatment is proposed. Temporary sheds for

workers will be established at the site. Chaliyama village has a primary school, power supply for domestic use. Besides this the village also have bank, post and telegraph office and cultural facilities.

4.6 Soil classification

Top soil samples were collected from north and south in the project site and from one Potka village in the study area during the study carried out in 2019. The results indicate that the soil of the project site is nearly neutral while that of Potka village slightly acidic. Organic carbon is deficient in all the three samples. Soil of the project site as well as study area is medium grain sand.

4.7 Climatic data from secondary sources

Temperature

As per the nearest IMD station, Jamshedpur (data available for 1981 – 2009 in climatological tables), the mean of minimum temperature ranges from 11.8 °C in January to 26.3 °C in June and the mean maximum temperature ranges from 27 °C in January to 39.2 °C in April.

Rainfall

Rainfall shows wide and erratic variations. The total average rainfall from 1981 to 2009 is 1372.4 mm varies from 8.2 mm in December to 316.5 mm in July.

Relative Humidity

The relative humidity is higher in the morning hours averaging 72% compared to night hours with an average of 63%. The relative humidity varies from 57% in April to 84% in July and August during morning and from 40% in March to 81% in August during evening.

4.8 Social infrastructure available

There are schools, hospitals, health centers, etc. in the villages of the surrounding areas. Chaibasa is the nearest towns. List of amenities in villages in 15 km is given in **Annexure 4** uploaded at the end of Form 1 at parivesh.nic.in.

5.0 PLANNING BRIEF

5.1 Planning concept

The plant is already under expansion as per EC dated 19.01.2021 to a capacity of 2.8805 MTPA steel manufacturing. The implementation status of the existing EC is given in **Table 6** earlier.

The proposed project is being further expanded. It is now proposed to expand the sanctioned facilities from 2.8805 MTPA to 7.0185 MTPA. Details are given in **Table 2** earlier. Expansion will be established in the land adjacent to the existing under construction Steel plant of the Company. Raw material and finished products for the expansion project will be transported by road/ rail.

Manufacturing of sponge iron, pellets, finished steel product (with or without value addition such as galvanising, annealing, pickling & colouring), sinter and hot metal for sale shall take place. The increase in manpower will be from 5,530 to 7,330 persons.

5.2 Population projection

The existing & proposed project will give approximately 7,330 persons direct employment after enhancement. This includes 1800 persons of expansion phase. In addition to this, there will be indirect deployment of about 4,200 persons in the project. Many more persons will also get employment in the ancillary & other services connected with this project. Unskilled and semi skilled (after training) will be hired from displacees, land loses and local villagers in and around the plant while skilled, engineers, managerial staff and technical experts will have to be hired from outside.

5.3 Land use planning (break up along with green belt etc.)

Existing plant premises area is 933.44 acres. Additional land required for expansion will be 449.09 acres. The total plot area shall be 1382.53 acres. Break up of land use are given **Table 55**.

TABLE 55: BREAK UP OF PLOT AREA

Sl. No.	Description	Existing s per EC		Proposed	Total	
		Area (Acres)	%	Area (Acres)	Area (Acres)	%
1	Plants and facilities	486.86	52.16	240.891	727.75	52.64
2	Stock yards	70	7.5	30	100.00	7.23
3	Area for solid waste management	10	1.07	10	20.00	1.45
4	Green belt & plantation	308	33	148.199	456.20	33
5	Administration building	2.66	0.28	0	2.66	0.19
6	Water reservoir	5.92	0.63	0	5.92	0.43
7	Roads	50	5.36	20	70.00	5.06
Total		933.44	100.00	449.09	1382.53	100.00

5.4 Assessment of infrastructure demand (physical & social)

M/s Rungta Mines Ltd. will assess the demand of infrastructure (Physical & Social) in nearby areas of the plant site during the preparation of the EIA through village level surveys. Accordingly, development activities will be undertaken under corporate social responsibilities (CSR) program for the upliftment of the nearby communities.

5.5 Amenities / facilities

Education, Hospitals, drinking water, power supply, post and telegraph, banks, communication and approach roads are present in the villages in buffer zone within 15 Km of study area. These are listed village wise in **Annexure 4** uploaded at the end of Form-1 on parivesh.nic.in.

6.0 PROPOSED INFRASTRUCTURE

6.1 Industrial area (processing area)

For the purpose of expansion, 449.09 acres will be additionally required. Out of this 449.09 acres land, 328.64 acres is private land & 120.45 acres is government land. It is to be acquired.

6.2 Residential area (non processing area)

Few staff members, for the expansion phase from 2.8805 to 7.0185 MTPA, from outside will be accommodated in the proposed colony near Bankasai village. The colony will be established on an area of 25,891 sq.m. and built up area of 51,248 sq.m. with 490 dwelling units. Lawns and gardens, access roads of 5-9 m width, store, underground reservoir, STP and other services such as storm water drain, sewage system, water supply, power supply, etc. shall be provided.

6.3 Green belt

The green belt equivalent to 33% of the plot area will be developed

6.4 Social infrastructure

No private social infrastructure is proposed. The social infrastructure in the surrounding villages will be improved as a part of the CSR activities of the company.

6.5 Connectivity

Refer section 4.1

6.6 Drinking water management (source & supply of water)

Refer section 3.8

6.7 Sewerage system & industrial waste management

Domestic waste shall be generated from the plant office and colony, organic component of which shall be composted/ vermi composted. The sewage from the Plant and colony shall be led to Sewage Treatment Plant. It will be provided with biological treatment facility to control BOD and suspended solids. The treated effluent conforming to prescribed standards will be used for watering plantation.

The plant is/ will be based on zero discharge principle. All the domestic and industrial effluents is will be properly treated and completely recycled in the system. Thus, there will be no discharge of effluents envisaged from the plant.

6.8 Solid waste management

Refer section 3.9

6.9 Power requirement & supply / source

Refer section 3.8

7.0 REHABILITATION AND RESETTLEMENT PLAN

Approximately 20 households of Medki village will be displaced, rehabilitated and their homesteads dismantled. One crusher & one brick kiln in the northern expansion area will also have to be dismantled. The proposed additional 449.09 acres (181.74 ha) comprises 328.64 acres is private land and 120.45 acres is government land. It is to be acquired for which compensation shall be paid as per government norms. Preference will be given to displacees and land losers for employment.

The plant and allied activities will provide job opportunities for eligible persons and many will find employment in ancillary & other services connected with this project.

The proposed long term activity will open up market and opportunities growth for self employed and cultivators. To this extent, the impact will be significantly beneficial since un-employment and under employment is the main socio-economic problem faced by the people in this area.

8.0 PROJECT SCHEDULE & COST ESTIMATES

8.1 Project Schedule

The implementation schedule for the proposed additional units will tentatively be as follows, counted from the day of obtaining the last statutory clearance including land acquisition, environmental clearance, consent to establish, etc.

Sl. No.	Facilities	Completion schedule
1.	DRI plant	80 month
2.	Mini Blast Furnace	60 month
3.	SMS (with RH/ VD/ AOD)	60 month
4.	Rolling mill	80 month
5.	Power plant	80 month
6.	Oxygen	60 month
7.	Lime Plant	60 month
8.	Sinter plant	60 month
9.	Coke oven plant	60 month
10.	Cement plant	60 month

8.2 Cost of the Project

Existing	:	Rs. 9,654.97 Cr.
Proposed Additional	:	Rs. 11,650 Cr.
Total	:	Rs. 21,304.97 Cr.

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

The persons will be provided with either direct employment or indirect employment. They would be mostly recruited in unskilled, semi skilled office assistant categories etc. This will improve the economic condition of the local people. The employment of local people in primary and secondary sectors of project will upgrade the prosperity of the region.

With the advancement in technology and the stringency in permissible limits of emission along with regular monitoring, it is possible to operate large plants of this type by having minimal impact on the environment.