PRE-FEASIBILITY REPORT

For

"Expansion of Integrated Steel Plant
at

Village-Tainser, Tehsil- Lathikata, District-Sundargarh, Odisha -770 037

Schedule: 3(a), Metallurgical industries (Ferrous & Non-Ferrous) -"Category: A"

By-
M/s Jai Balaji Jyoti Steels Limited
Registered Office : 5, Bentinck Street, 1st Floor, Kolkata, West Bengal - 700 001

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CHAPTER - I
EXECUTIVE SUMMARY

1.1 Introduction

M/s Jai Balaji Jyoti Steels Limited is a private company, incorporated on 21 April 2003. It is registered at Registrar of Companies, Cuttack. M/s Jai Balaji Jyoti Steels Limited is a group company of Jai Balaji Group, one of the leading iron and steel manufacturers in the private sector. Jai Balaji Group is having integrated steel manufacturing units spread across India in the states of West Bengal, Chhattisgarh and Orissa, and a diverse portfolio of value-added products including DRI (Sponge iron), Pig iron, Ferro Alloys, Alloy and Mild Steel Billets, Reinforcement Steel TMT Bars, Wire Rods, Ductile Iron Pipes, Alloy and Mild Steel Heavy Rounds.

M/s Jai Balaji Jyoti Steels Limited is operating its existing manufacturing unit at Village Tainser, Tehsil – Lathikata, District – Sundergarh, Odisha. The total land available with M/s Jai Balaji Jyoti Steels Limited is 89.67 acres. The existing units is now spread over an area of 15 acres and operating with DRI plant [120,000 TPA], Induction furnace based SMS with Caster [92,400 TPA] and Coal Washery [500,000 TPA].

Considering the potential steel demand in India, the company has proposed for expansion of production by modification/addition of some units along with captive power plant within the existing premises. There is no National Park, Sanctuary or Forest Land in surrounding 10 Km radius. The project doesn't fall under CRZ boundaries.

Table 1.1 Salient Features of the Project

1	Name of the Company	**M/s Jai Balaji Jyoti Steels Limited**
2	Registered Office Plant Address	**Registered Office** Unitech House, Udit Nagar Rourkela – 769012 (Odisha) **Plant Location:** Village Tainser, Near Birkera, Tehsil - Lathikata, District – Sundargarh, Odisha – 770 037
3	Name of the Directors	Mr. Aditya Jajodia, Mr. Rajiv Jajodia, Mr. Dinesh Kumar Agarwal, Mr. Sanjay Kumar Ladia.
4	Proposed Sector	3(a), Metallurgical industries (ferrous & non-ferrous) – Category A
5	Land	89.67 Acres in procession of company
6	SOI Topo Sheet No	73 B/16
7	Project Site Co-ordinates	Coordinates of Four Points Latitude Longitude Point A- 22° 5'19.17"N 84°51'22.03"E Point B- 22° 5'20.67"N 84°51'48.79"E

		Point C- 22° 4'50.35"N 84°51'55.36"E Point D- 22° 5'3.24"N 84°51'22.09"E
8	Expansion Projects	Expansion of DRI Plant (from 120,000 TPA to 714,000 TPA sponge iron), SMS–IF Based (92,400 TPA to 356,400 TPA billets), New EAF with LRF, AOD & Caster (66,000 TPA billets), New Rolling Mill (422,400 TPA TMT Bars and Wire Rods), New SAF with Briquette Plant (112,000 TPA Ferro Alloys - (FeCr/ SiCr/ FeMn/ SiMn/ FeSi.), New Iron Ore Beneficiation cum Pellet Plant (16,00,000 TPA), New Coal Gasifier (9000 Nm3/hour) and New Captive Power Plant (110 MW – 55 MW WHRB & 55 MW AFBC)z
9	Cost of Expansion Projects	INR 1485 Crores
10	Total Manpower	Existing - 650 Proposed – 1900
11	Total Power Requirement	For existing Project – 18 MW Source: State Grid For expansion project - 110 MW Source: Captive Power Plant. Emergency Power: 2 x 500 KVA DG set
12	Total Water Requirement Source Permission	Total: 8192 KLD Existing: 682 KLD Proposed Expansion Projects: 7510 KLD Source: Brahamani River Infrastructure: Intake point and Pipeline is available Permission to take Water : Available from WRD

Raw Materials Requirement

SN	Name	Quantity, TPA	Source and Transportation
1	Iron ore fines	19,20,000	OMC mines / private mines in Barbil-Joda by rail & road
2	Coal	10,70,000	Mahanadi Coalfields, & other coal fields by rail & road
3	Dolomite	34,650	Bilaspur, CG by rail & road
4	MS Scrap	1,02,400	Local market by road
5	Bentonite	15,000	From Kutch Gujarat by rail & road
7	Quartzite	1500	From mines in Odisha by rail & road
8	Limestone	32,500	From mines in Odisha by rail & road
9	Manganese ore	2,74,500	From mines in Odisha by rail & road
10	Nut Coke	77,300	From Jharkhand/ Odisha by road
11	Mollases	2000	From Distilleries in Odisha by road
12	Chrome ore	1,68,000	From mines in Odisha by rail & road

Wastewater: The wastewater generated from various process, cooling blowdown, boiler blowdown, canteen, domestic sewage will be segregated at source and subjected to primary treatment and then reused, recycled or recirculated. Sewage will be treated in STP and the treated water will be recycled for gardening purpose. Zero liquid discharge will be maintained.

Solid Wastes: Dolochar (158400 TPA) will be reused as fuel for power generation after mixing with coal. Iron ore tailings (320000 TPA) will be reused in cement plant, construction and landfilling purpose. SMS slag (52800 TPA) and Ferroalloy slag (88676 TPA) will be crushed and metal recovery will be done. Thereafter the crushed slag will be reused for cement making, road making and other construction purpose. Fly ash and bottom ash (150000 TPA) will be used to fill up mine voids, making embankments, making brick, block and tiles and used in other construction purposes.

Air Pollution Control Measures:

	Name of the Process Unit	Nature of Emissions	Name of Control System	Emission Limit	Stack Height
1	Pellet Plant (TG-Kiln)	PM	ESP	PM <30 mg/Nm^3	70 m
2	Ball Mills (Additive Grinding)	PM	Bag House	PM <30 mg/Nm^3	30 m
3	DRI Kilns	PM	DSC and ESP	PM <30 mg/Nm^3	90 m
4	DRI raw material handling	PM	Bag House	PM <30 mg/Nm^3	30 m
5	DRI product handling	PM	Bag House	PM <30 mg/Nm^3	30 m
6	DRI Product separation	PM	Bag House	PM <30 mg/Nm^3	30 m
7	SMS (Induction Furnaces)	PM	FES & Bag House	PM <30 mg/Nm^3	30 m
8	SMS (Electric Arc Furnace)	PM	4th Hole extraction on covered hood and Bag House	PM <30 mg/Nm^3	30 m
9	SAF	PM	4th Hole extraction on covered hood and Bag House	PM <30 mg/Nm^3	30 m
10	Power Plant (AFBC)	PM	ESP	PM <30 mg/Nm^3	90 m
11	Coal Mill	PM	ESP	PM <30 mg/Nm^3	30 m

Note: All bag house will be of PTFE bags

CHAPTER – 02

INTRODUCTION OF THE PROJECT/BACKGROUND INFORMATION

2.1 Identification of Project & Project Proponent

M/s Jai Balaji Jyoti Steels Limited, has proposed expansion of integrated steel plant project within the existing premises at Village Tainser, Near Birkera, Tehsil - Lathikata, District – Sundargarh, Odisha – 770 037.

Project Promoters

M/s Jai Balaji Jyoti Steels Limited is a group company of Jai Balaji Group which is one of the largest steel manufacturers in the private sector in Eastern India. The group is vertically integrated and thereby facilitating consumption of output by its own downstream units. The Company is fully geared to fulfill the demand of consumers' through-out the country and to reap the benefits of growth in infrastructure and industrial sector. Directors of M/s Jai Balaji Jyoti Steels Limited are Mr. Aditya Jajodia, Mr. Rajiv Jajodia, Mr. Dinesh Kumar Agarwal, Mr. Sanjay Kumar Ladia.

Mr. Aditya Jajodia : The Chairman and Managing Director of the group's flagship company, Jai Balaji Industries Ltd., Mr. Aditya Jajodia, joined the group at a very early age and his experience of over 35 years with the company has proven to be invaluable. He was not only the driving force in setting up our first manufacturing unit, but has also played an instrumental role in the phenomenal growth of the group into one of the largest vertically integrated steel manufacturing houses in India.

Mr. Rajiv Jajodia: The Director of Jai Balaji Industries Limited is a visionary with more than three decades of experience in the steel sector. He has helped the company tap it's potential and enabled it to grow and expand phenomenally to what it as today. His dedication has played a key role in improving logistical and operational efficiency, increasing cost competitiveness, and in earning a turnover of over Rs. 2000 crore.

As mentioned above the promoters are experienced, energetic and resourceful persons with good links for effective operations of the proposed expansion of integrated steel plant. The promoters are financially stable and will be able to execute the project successfully and in specified time and run it efficiently.

2.2 Brief Description of Nature of the Project

The existing plant is operating with DRI unit, Induction Furnace based SMS with caster and Coal washery unit. DRI plant and Induction Furnace based SMS with caster unit will be expanded along with addition of new EAF with LRF, AOD and Caster, New SAF with Briquette Plant, New Rolling Mill, New Iron Ore Beneficiation Plant and Pellet Plant with coal Gasifier, and Captive Power Plant.

S. No	Name of the Unit & Product	Existing Capacity (TPA)	Proposed Expansion (TPA)	Final Capacity after Expansion (TPA)
1	DRI Plant (Sponge iron)	120000 (4 x 100 TPD)	594000 (3 x 600 TPD)	714000 (4x100 TPD + 3x600 TPD)
2	Induction Furnace based SMS with Caster (Billets)	92400 (4 x 7 tons)	264000 (4 x 20 tons)	356400
3	EAF with LRF, AOD, Caster (Billets)	-	66000 (1 x 20 tons)	66000
4	Rolling Mill (TMT Bar & Wire Rods)	-	422400	422400
5	Coal Washery (Clean coal & Rejects)	500000	-	500000
6	Iron Ore Beneficiation cum Pellet Plant (Pellets)	-	1600000	1600000
7	Coal Gasifier (Producer Gas)	-	9000 m^3/h (3 x 3000 Nm^3/h	9000 m^3/h
9	SAF with Briquette Plant – Ferro Alloys (FeCr/ SiCr/ FeMn/ SiMn/ FeSi.)	-	112000 (3 x 16.5 MVA)	112000
10	Captive Power Plant	-	110 MW 1 x 10 MW WHRB 3 x 15 MW WHRB 1 x 55 MW AFBC	110 MW

"The project falls under Category 'A' of Schedule 3 (a), as per the EIA Notification, 2006 & its amendments thereof and will be appraised by EAC (Industry-I), MoEF&CC, New Delhi"

2.3 Need of the Project and Its Importance to the Country and/or Region.

Steel is considered the backbone of national economic development. A vibrant steel industry has historically been the foundation of a nation's rapid industrial development and is considered a yardstick for the improving standard of living of the people in a country.

India was the world's second-largest steel producer with production standing at 111.2 million tons (MT) in 2019. The growth in the Indian steel sector has been driven by domestic availability of raw materials such as iron ore and cost-effective labour. Consequently, the steel sector has been a major contributor to India's manufacturing output.

The Indian steel industry is modern with state-of-the-art steel mills. It has always strived for continuous modernization of older plants and up-gradation to higher energy efficiency levels.

Honorable Prime Minister Shri Narendra Modi has envisaged the growth of steel sector to attain a production capacity of 300 Million Ton by 2030-31. Hence, in order to achieve this

capacity, it is essential to create the facilities based on local resources to produce steel. The Honorable Prime Minister has also proclaimed the global commitment to fight Climate Change; hence the importance of creating the facilities to achieve highest energy efficiency in core sector industries is also very essential.

In view of the above facts, the proposed expansion project for production of steel becomes a project of national interest. Also, the proposed direct reduction process is comparatively energy efficient. Steel made using DRI requires significantly less fuel compared to traditional blast furnace. DRI is made into steel using electric arc furnaces to take advantage of the heat produced by the DRI product. The WHRB power plant along with DRI Kiln will generate captive power without combustion of fossil fuel. Due to which a substantial amount of GHG emission would be avoided or reduced than the baseline emission.

2.4 Demand – Supply Gap

Inception of new technologies in steel making has completely changed the steel making scenario in India. Today in India secondary steel making based on Coal based DRI and Induction furnace looks to be the best choice due to several advantages endowed in it. The 24 Pulse Induction Crucibles have reduced the power consumption substantially too. More and more automation is making Indian Manufacturers more competitive than other countries who are the current global leaders in steel production.

During past 12 years, domestic steel demand has witnessed continuous growth. Since then the production of steel also has gone up by 75% while domestic steel demand has grown by around 80%.

Steel sector is one of the most vital sectors for the economy of India therefore government of India has introduced the National Steel Policy in 2017. It gives the road map for growth of Indian steel industry till 2030–31.

The salient features of the policy are as follows:

- Steel-making capacity is expected to reach 300 million tons per annum by 2030–31.
- Crude steel production is expected to reach 255 million tons by 2030–31, at 85%
- capacity utilization.
- Production of finished steel to reach 230 million tons, assuming a yield loss of 10% for conversion of crude steel to finished steel – that is, a conversion ratio of 90%.
- With 24 million tons of net exports, consumption is expected to reach 206 million tons by 2030–31.
- As a result, per capita steel consumption is anticipated to rise to 160 kg.
- An additional investment of INR 10 lakh crore is envisaged. While the National Steel Policy, 2017, is a vision document of the Indian government, it nevertheless emphasizes the growth potential of the Indian steel industry.

In terms of demand, India is expected to see a huge growth in the coming years, due to government initiatives like affordable housing in urban and rural areas, railway network expansion, development of the domestic shipbuilding industry as part of the Sagarmala

project, opening up of defense sector for private participation as well as growth in the automobile sector. In fact, the demand is expected to grow threefold and reach 230 MT by 2030-31

In June 2021, Minister of Steel & Petroleum & Natural Gas Mr. Dharmendra Pradhan addressed the webinar on 'Making Eastern India a manufacturing hub with respect to metallurgical industries', organized by the Indian Institute of Metals. In 2020,

'Mission Purvodaya' was launched to accelerate development of the eastern states of India (Odisha, Jharkhand, Chhattisgarh, West Bengal and the northern part of Andhra Pradesh) through establishment of an integrated steel hub in Kolkata, West Bengal. Eastern India has the potential to add >75% of the country's incremental steel capacity. It is expected that of the 300 MT capacity by 2030-31, >200 MT can come from this region alone.

Overall, the demand prospects of steel-using sectors remain positive, with steel demand set to grow. To cater to the recent and anticipated surge in domestic demand, export and enhancement in the economy of scale, various existing steel producers and new entrepreneurs have drawn expansion plans/Greenfield steel projects/acquisitions & mergers.

2.5 Imports vs. Indigenous Production

India's strategic location marked by a long coastline to enable exports and imports makes it a key player in the global steel market. In addition to the local domestic demand the Indian Steel sector is likely to become a major exporter of steel in times to come as new technology to reduce the energy requirement is being developed and rapidly adopted by the industries.

Apart from catering to a robust domestic demand, the Indian steel industry is a global exporter as well and has reduced its import requirements from 9.32 MT to 7.83 MT over the past 5 years. India was a net exporter in 2016-17 and 2017-18, however returned to being a net importer in 2018-19. India has been a net exporter of finished steel in FY20.

Prior to implementation of these energy efficient type of integrated steel plants, the gap between demand and supply was being fulfilled by import of steel. The Chinese manufacturers were giving tough competition to Indian steel producers because of their cheaper production cost mainly due to abundantly available coking coal in their country.

Therefore, in order to face the competition being poised by the Chinese manufacturer it is important to reduce cost of product, as well as produce good quality of steel. Therefore, this type of project is important to be implemented.

2.6 Export Possibility

Export of Steel is always possible, the Government of India is also encouraging export of steel, however proposed quantity will be domestically consumed. Possibilities to export the material, would also be explored. In all there is good market demand of steel– both in India & abroad.

2.7 Employment Generation (Direct & Indirect) Due to the Project

The unit will need Technical qualified personals for organizing the production and then several skilled workers for operating the unit and for working in workshop, etc. Besides all these type of workers a number of semiskilled and unskilled workers will also be required for peripheral activities like transport, logistics, engineering, Services, commercial services etc.

Total manpower required for the project is approx. 1,900 persons (For Admin staff – 100 and for Production - 1800).

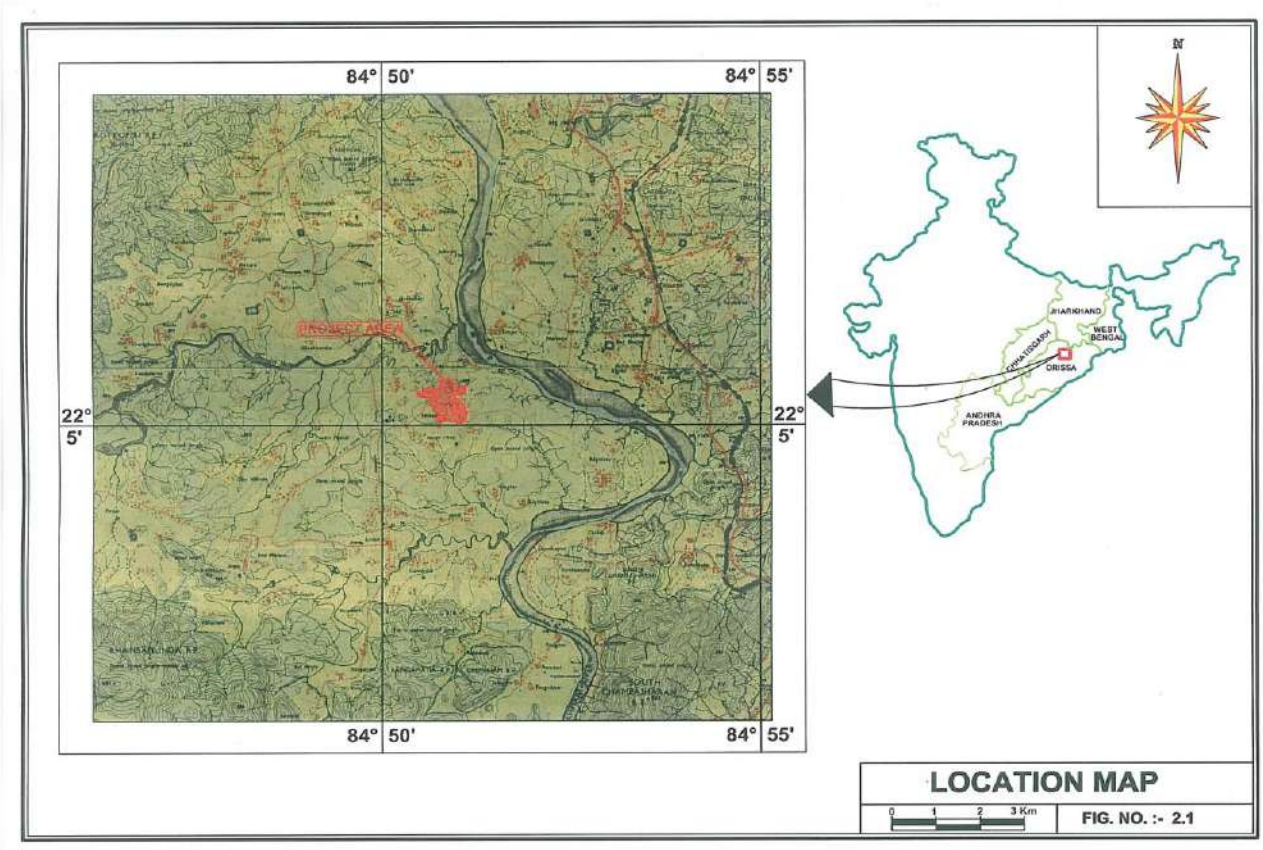
CHAPTER - 3
PROJECT DESCRIPTION

3.1 Type of Project

Expansion of DRI Plant (from 120,000TPA to 714,000 TPA sponge iron), SMS–IF Based (92,400 TPA to 356,400 TPA billets), New EAF with LRF, AOD & Caster 66,000 TPA billets, New Rolling Mill (422,400 TPA TMT Bars and Wire Rods), New SAF with Briquette Plant (112,000 TPA Ferro Alloys- FeCr/ SiCr/ FeMn/ SiMn/ FeSi.), New Iron Ore Beneficiation cum Pellet Plant (16,00,000 TPA), New Coal Gasifier (9000 Nm^3/h) and Captive Power Plant (110 MW- 55 MW WHRB and 55 MW AFBC)" at Village–Tainser, Dist- Sundergarh, Odisha.

The proposed project falls under Category "A", as per EIA notification 2006 and its amendments thereof and therefore, requires Environment Clearance from MoEF&CC.

3.2 Location (Map Showing General Location, Specific Location, and Project Boundary & Project Site Layout) With Coordinates.



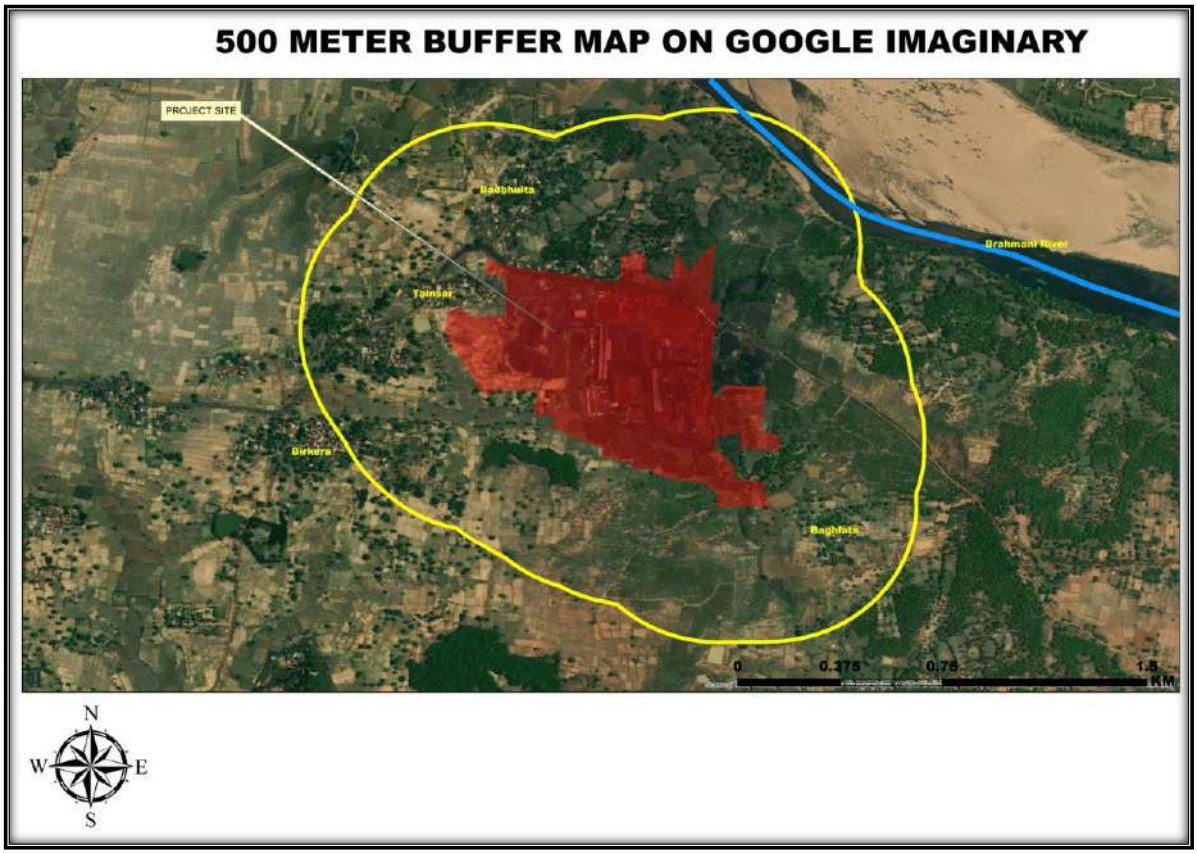


Fig 1: Google Image of project Site (500-meter Radius)

3.2.1 Plant Layout

The layout of the plant has been developed taking into following considerations:

- Availability of raw material.
- Sufficient space for storage of raw materials and finished products.
- Green belt, plantation, RWH & space for pollution control facilities will be provided.
- Process will be consolidated into comprehensive production units. The major utilities and service facilities available for the project.

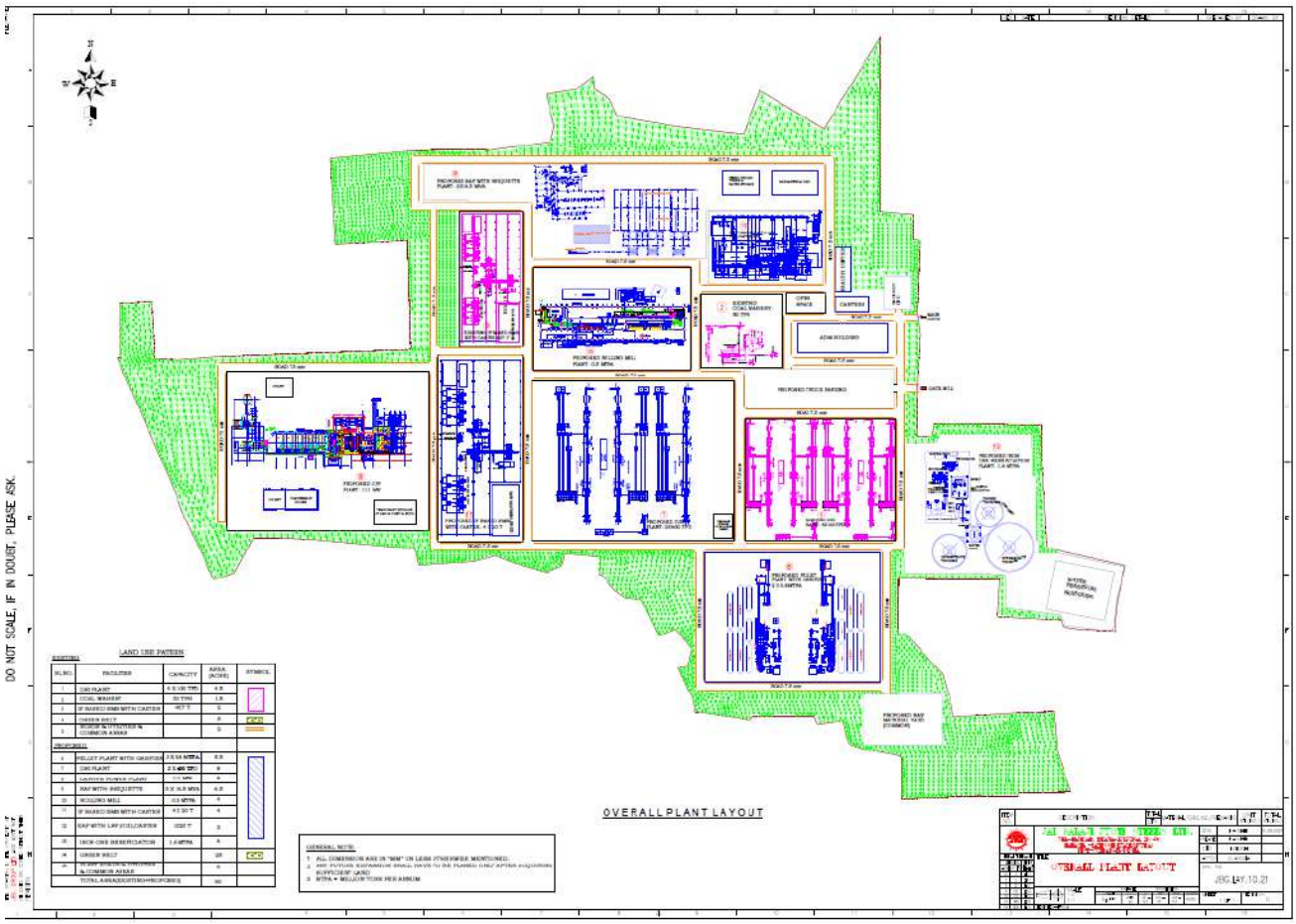


Fig: 3 Layout Plan

3.3 Details of Alternate Sites Considered and the Basis of Selecting the Proposed Site, particularly the Environmental Considerations should be highlighted.

This is a forward integration of existing plant. Land for expansion is already available, hence alternate sites not examined. The proposed expansion has been planned within the existing premises.

3.4 Size or Magnitude of Operation

It is Category A Metallurgical sector project. The project cost of expansion project is Rs 1485 Crores. The project will be executed in an area of 89.67 acres. The water requirement for the post expansion project will be 8192 KLD.

3.5 Technology and Process Description:

Technology

Iron Ore Beneficiation: Wet grinding technology of making concentrate

Pellet Plant: Travelling Grate – Rotary Kiln technology

Sponge Iron: Conventional Rotary Kiln technology

Steel Billets: Induction Furnace with CCM

Special Steel: Electric Arc Furnace, LRF, AOD and CCM

Ferroalloys: Submerged Arc Furnace

1 PROCESS – BENEFICIATION CUM PELLETISATION PLANT

The pellet plant will produce iron ore pellets which are heat hardened balls produced from iron ore concentrate. The pellets have improved properties for iron making. Pelletization process involves making iron ore concentrate, grinding of raw materials, feed preparation in mixer, green ball formation in balling disc and induration of green pellets.

Steps involved in Pelletization process are as follows:

Pellet making process involves wet grinding of iron ore fines, filtration of concentrate, grinding of limestone in ball mill, mixing concentrate and limestone fines with bentonite, balling, indurating, segregation and stockpiling. To meet the iron ore requirement of DRI plant, 2x0.8 MTPA Pellet Plant [1600,000 MTPA production] will be established. In pellet making technology iron ore fines are converted into small pellets suitable as burden to DRI plant. Iron ore fines and additives (like limestone, and Bentonite) are grounded in a Grinding Unit. The grounded material is transported pneumatically to mixer. The mixed material is conveyed to balling disc for making green balls, where water is added. The green balls are called pellets, which are screened to 9~16 mm size in a double deck roller screen. Oversized and undersized material are returned to mixed material bins for reuse. The pellets are fed by conveyor to the traveling grate of indurating furnace for heat hardening. Mixed gas (producer

gas) will be used as fuel to achieve temperature of 1300°C. Producer gas plant is also considered to supply the gaseous fuel requirement of pellet plant. Heat provides re-crystallization, bonding and imparts strength to the pellets. The indurated pellets are air-cooled using a fan. The cooled pellets are taken to product bins by belt conveyors after separation of oversize and under size separation bin.

- **Grinding of iron ore**

Material Handling Area:

Iron ore is fed to the ground hopper and then conveyed to the day bin by a conveyor. Belt weigh feeder is provided under the bin to control the feed to the plant. The feeder delivers the ore to the screen feed conveyor which conveys the ore to screen-

Grinding Area:

The Material through a launder onto the Ball mill feed conveyor (if required), there shall be a belt scale installed beneath the conveyor. Measured quantity of water in proportion to the belt scale reading shall be added so as to ensure pulp density of about 70% in the Ball Mill. The slurry discharging from the Ball Mill is received into the Ball Mill discharge sump box. Suitable quantity of process water is added into the sump to maintain the pulp density as desired to be fed to the Stack Sizer.

The slurry from the Ball Mill discharge sump box is pumped to the stack sizer which is in closed circuit with the Ball Mill. The Undersize material is collected in the stack sizer underflow collection sump and then slurry from the stack sizer underflow collection sump is pumped to the Concentrate Thickener and over size of stack Sizer will feed again to ball mill because of this system is based on close circuit.

Thickening Area:

Concentrate: The underflow from the concentrate thickener at 60–65% solids w/w basis is sent to the holding tank. The overflow from the thickener will be taken to water complex then pumped to the process water tank. Slurry from the concentrate thickener is pumped to holding tanks which are fitted with suitable agitators to prevent the slurry in the tank from settling. The slurry is then pumped by suitable pumps to the filter area.

Filter Area:

Concentrate: The slurry from the holding tanks is dewatered using pressure filters. The cake is discharged in batches from the filter at the end of each cycle and is collected by a cake collection conveyor and dropped on to a reversible conveyor. While travelling on one side, the cake will be conveyed to pellet plant and while travelling the other direction, the cake will be transported to a temporary cake storage area. The filtrate along with cloth wash water and core flush water is collected in filtrate tank & then pumped to the concentrate thickener. Slurry receiving and filtration: The iron ore will be received by pipe line in slurry form in slurry receiving tanks and filtered in high efficient pressure filters. The iron ore is

dewatered (called concentrate). The filtrate is clarified and reused in the pellet making process.

Mixing: The iron ore concentrate is mixed with additives like coke fines, limestone powder, and Bentonite in high intensity mixer and with required quantity of water for ideal moisture for next stage of process called balling

Balling: The homogeneous feed is fed to balling discs. Green balls are formed in an inclined pan of 6.0 m diameter, driven by variable frequency drives.

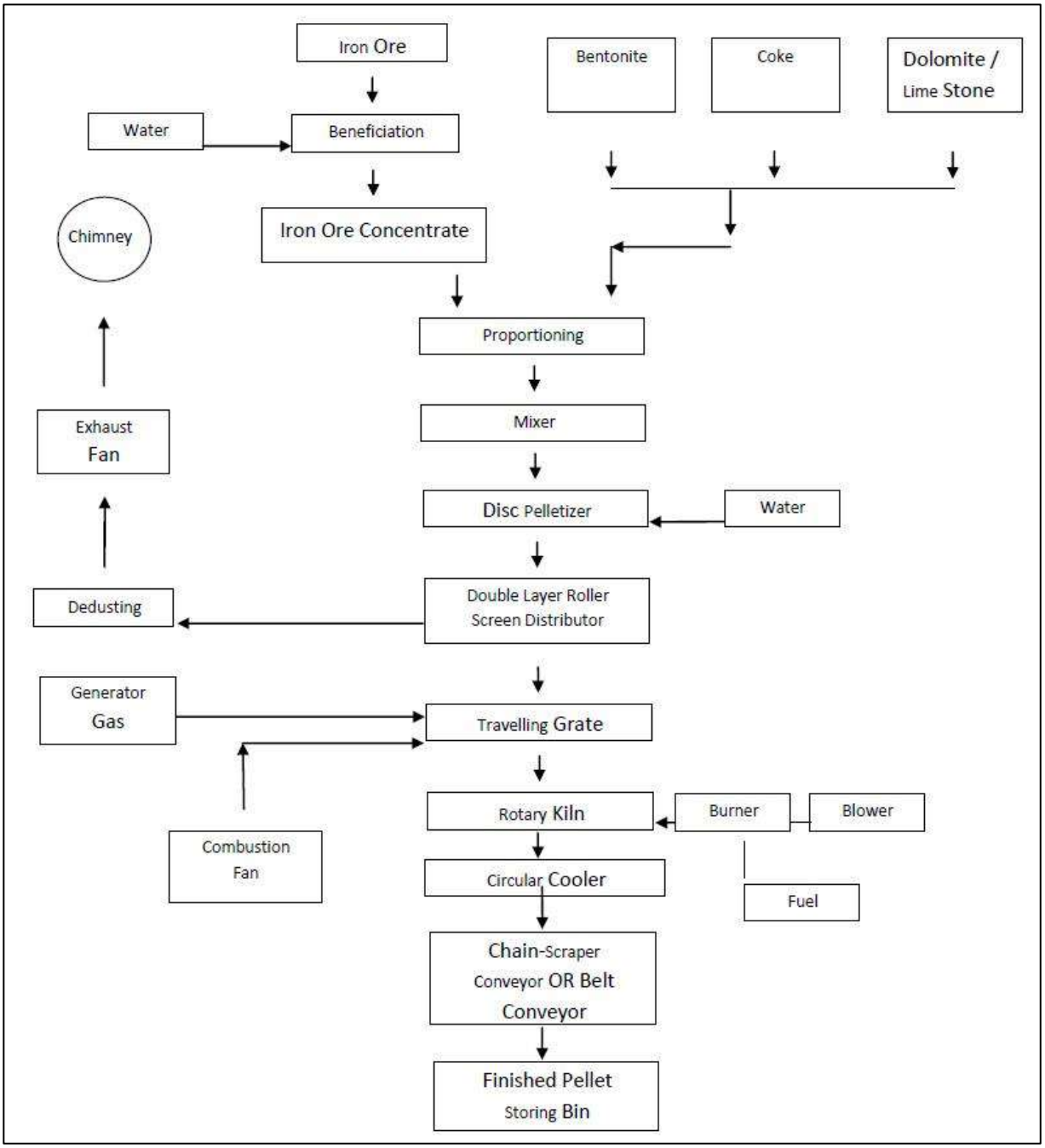


Figure 4: Process Flow [Pelletization Plant]

2. PROCESS - DRI PLANT (Sponge Iron Production)

In order to meet the sponge iron requirement for steel manufacturing project, M/S Jai Balaji Jyoti Steels Limited is intending to expand its existing direct reduction sponge iron plants using coal as reductants. For the aforesaid purpose, it is proposed to install three more [3 @600 TPD] coal based (Conventional Type) rotary kilns

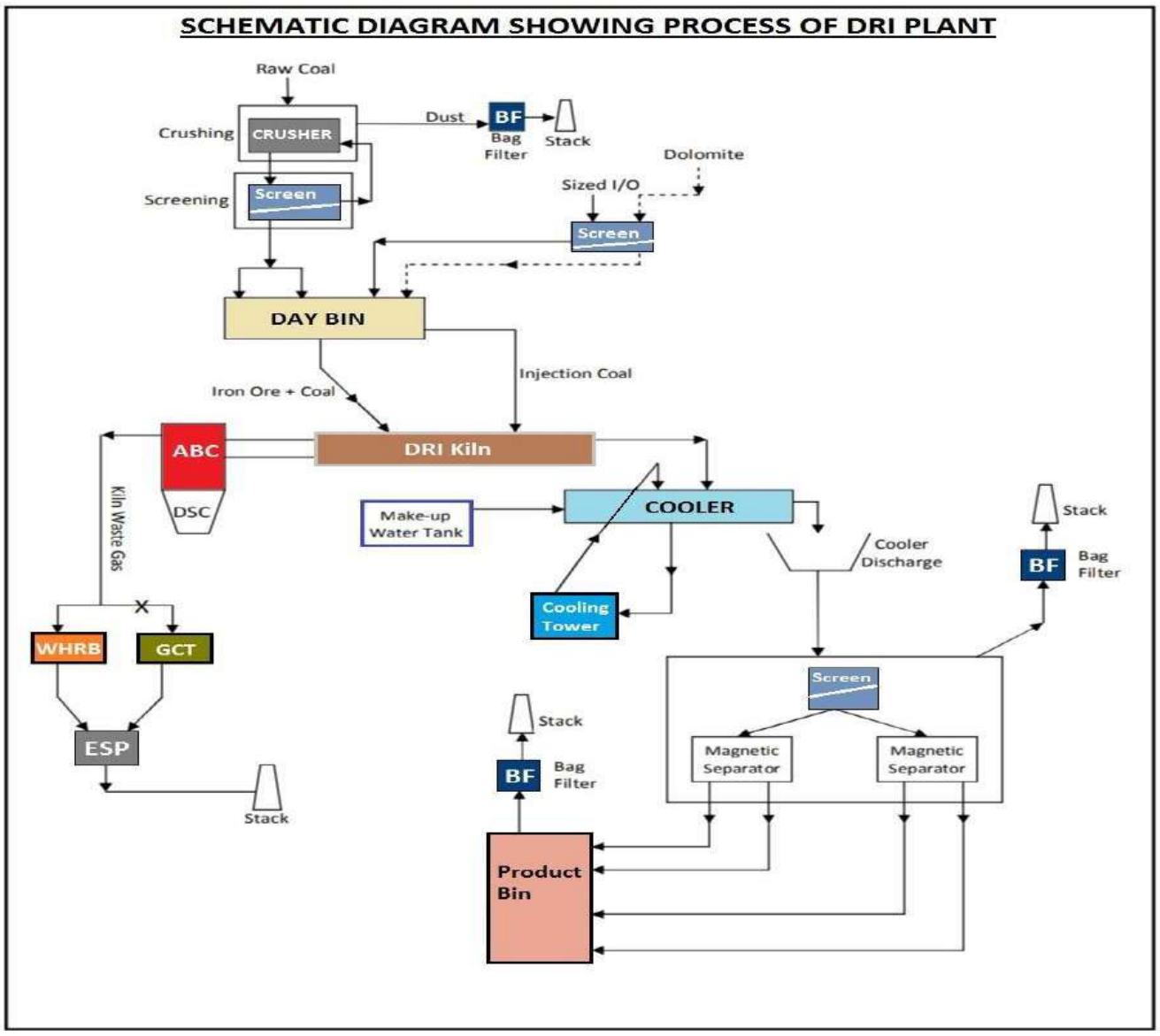
In DRI plant, the Oxide Ore Fe2O3 (Hematite) is reduced to 'Fe' by using Carbon as reductant. The process can take place at 900-1000°C. Coal provides the heat as well as reducing gases. Dolomite chips of size (-3 mm) are used as flux to Scavenge Sulphur content from coal and preventing the combining of this impurity with iron. The process is carried out in a Rotary Kiln. Brief features of the process are as follows:

- Kiln process of DRI production involves tumbling of iron ore with select grade of non-coking coal and dolomite in a rotary kiln.
- The kiln is supported on roller stations and rotated by means of a variable speed DC Drive & motor and girth gear mechanism. Refractory lined rotary kiln of suitable size is placed on four support stations and is kept inclined at 2.5 % slope.
- The transport rate of materials through the kiln can be controlled by varying its speed of rotation. There are inlet and outlet cones at opposite ends of the kiln that are cooled by individual fans.
- The kiln shell is provided with small sampling ports, large ports for rapid removal of the contents in emergency or for lining repairs. Longitudinal positioning of the kiln on its riding rings is controlled hydraulically.
- The coal and iron ore are metered into the high end of the inclined kiln. A portion of the coal in pulverized form is also injected pneumatically from the discharge end. The burden first passes through a pre-heating zone where coal devolatilisation takes place and iron ore is heated to pre-heating temperature for reduction.
- Temperature and process control in the kiln will be carried out by installing suitable no. of air injection tubes made of heat-resistant steel. These are spaced evenly along the kiln length and countercurrent to the flow of iron ore. Tips of the air tubes are equipped with special internal swirlers to improve uniformity of combustion.
- A central burner located at the kiln discharge end is used with LDO for heating the cold kiln. After initial heating, the fuel supply is turned off and the burner is used to inject air for coal combustion.
- The kiln temperatures are measured with fixed thermocouples and Quick Response Thermocouples (QRT). Fixed thermocouples are located along the length of the kiln to monitor temperature profile of kiln. Fixed thermocouples, at times, may give erratic readings due to coating with ash, ore or accretion. In such a case QRT are used to monitor the kiln temperatures.

- The product (DRI) is discharged from the kiln at about 1000°C. An enclosed chute at the kiln discharge end is used to transfer the hot DRI to a rotary cooler. The cooler is a horizontal revolving cylinder of appropriate size, wherein DRI is cooled indirectly by water spray on the cooler upper surface. The cooling water collected in troughs below is pumped to the cooling tower for recycling along with make-up water.
- DRI is cooled to about 100°C without exposure to atmospheric air. A grizzly in the chute removes accretions that are large enough to plug up or damage the cooler discharge mechanisms.
- The product is screened to remove the plus 18 mm DRI. The undersize - a mix of DRI, dolochar and coal ash are screened into +/- 3 mm fractions. Each fraction passes through a magnetic separator. The non-magnetic portion is the dolochar which has usable calorific value and will be used in the CFBC Boiler as fuel.
- Magnetic portion of each fraction is DRI, which can be used directly for steel making. • The kiln waste gases leave at about 850-900°C. These are passed through dust settling chamber where heavier particles settle down due to sudden decrease in velocity of gases. The flue gases are then passed through an After Burning Chamber (ABC) where un-burnt combustibles are burnt by blowing excess air.
- The temperature of the after burner chamber, at times, is controlled by water sprays.
- The thermal energy in outgoing flue gases will be recovered through Waste Heat Recovery Boiler (WHRB) where sensible heat of the gases will be extracted and then discharged into the atmosphere after passing through pollution control equipment like ESP, ID fan and stack.
- In case the WHRB is under maintenance, then the Flue gases are passed through a down duct into an evaporation cooler where its temperature is brought down (GCT-Gas Conditioning Tower) and balance dust particles are separated through the pollution control equipment namely ESP. The gas is let off into the atmosphere through stack via ID fan.

4 x 100 TPD Existing				
Finished Product Sponge Iron 120000 TPA	**Raw Materials**	**Pellet**	**Coal**	**Dolomite**
	Quantity TPA	180000	147600	36000
3 x 600 TPD Proposed				
Finished Product Sponge Iron 594000 TPA	**Raw Materials**	**Pellet**	**Coal**	**Dolomite**
	Quantity, TPA	891000	730620	17820

The hot gases from DRI kiln will be taken to WHRB and after heat recovery it will be used for Power Generation. A total of 70 MW will be generated through flue gases from the DRI plant. Process schematic of Sponge Iron manufacturing is as shown below



Flow Sheet of DRI Proces

3. INDUCTION FURNACE BASED STEEL MELTING SHOP

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.

Steel Making through Melting in Induction Furnace (IF), secondary refining in a Ladle Furnace (LF) and Slab Casting in a Continuous Casting Machine has been selected as the process route of converting the charge mix of Sponge Iron and Scrap to Slabs required for the Rolling Mill by Hot charging method.

Provision shall be made in the Caster to produce billets also in case of market demand. The proposed process is well established and is most environment friendly and energy efficient. The billet from the caster shall be hot charged to the Rolling Mil without reheating furnace to reduce fuel consumption. Provision has been made for reheating furnace with furnace oil which shall be used in case of emergency.

Induction Furnace (Existing)
(4 x 7 T)

Finished Product (Billets)	Raw Materials			
92, 400 TPA	**Sponge Iron**	**Pig Iron**	**Scrap**	**Fe Alloys**
	83,160 TPA	14,137 TPA	9,702 TPA	1109 TPA

Induction Furnace (Proposed)
(4 x 20 T)

Finished Product (Billets)	Raw Materials			
264,000 TPA	**Sponge Iron**	**Pig Iron**	**Scrap**	**Fe Alloys**
	237,600 TPA	40392 TPA	27720 TPA	3168 TPA

Induction Furnace

- The Charge-Mix shall comprise 70-75% Sponge Iron & balance Pig Iron and scrap.
- The material shall be charged to the IF through a Vibro Feeder at desired rate matching the melting rate in crucible.
- The scrap is melted first to create a molten bath. Sponge Iron is then charged continuously through Vibro-Feeder. Slag formed is removed periodically.
- After completion of charging and melting, a sample will be drawn to determine the composition of the liquid steel. Adjustment in composition is made by adding right quality of scrap/petroleum coke for achieving the necessary carbon content in the bath.
- After achieving the desired melt analysis, the temperature is raised to the required tapping temperature and the furnace is then tilted rapidly to discharge the liquid steel into a preheated refractory lined ladle.

Billet Caster (6 / 11 m radius, 3 strand)

- Liquid Steel Ladle after Ladle Furnace secondary refining will be taken to the Continuous Casting Machine. The Ladle is raised and placed onto a ladle stand above the Tundish. Liquid metal flows out of the Ladle Slide gate into the Tundish and then into the water-cooled oscillating copper mould. Solidification begins in the mould, and continuous through the secondary water spray cooled zone having strand guide rollers. The strand is then straightened by withdrawal rolls, torch cut and then discharged for intermediate storage or hot charged for rolling.

- The Billet Caster shall have two (2) Strands with 6/11 m radius. Provision is kept for casting of square billets range from 130 x 130 mm to 150 x 150 mm size to meet any market demand.
- The Caster shall be complete with Ladle Stand, Two (2) Nos. Tundish Cars, Mould Assemblies and Oscillation-Device, Strand Guide Segments & Supports, Withdrawal & Straightening System, Mould & Strand Cooling System, Cut-off equipment including length measuring device, dummy bar system and slab discharging bed & hot charging rolled table etc. The complete machine shall have PLC controls.

Fume Extraction System

Fumes generated during the process extracted through a collection hood. The IF fumes will be sucked through a cyclone-cum-spark arrestor & Cooler and LF fumes will be sucked through its roof outlet. These fumes then pass through a pulse-jet type bag filter to remove the dust particles. ID Fans installed after the bag filter are used for suction of fumes and discharge the clean gas into atmosphere through a stack. Particulate emission at Stack outlet will not exceed 30 mg/Nm3. Stack height will be 30 m.

4. ELECTRIC ARC FURNACE (EAF) BASED STEEL MELTING SHOP

Electric Arc Furnace (EAF) is also a steel making furnace, in which steel scrap is heated and melted by heat of electric arcs striking between the furnace electrodes and the metal bath. The main advantage of the Electric Arc Furnaces over the Basic Oxygen Furnaces (BOF) is their capability to treat charges containing up to 100% of scrap. About 33% of the crude steel in the world is made in the Electric Arc Furnaces (EAF).

1 x 20 T EAF

Finished Product	Raw Materials			
66000 TPA Billets	Sponge	Pig Iron	Scrap	Fe Alloys
	59400	10098	6930	792

- The furnace consists of a spherical hearth (bottom), cylindrical shell and a swinging water-cooled dome-shaped roof.
- The roof has three holes for consumable graphite electrodes held by a clamping mechanism. The mechanism provides independent lifting and lowering of each electrode.
- The water-cooled electrode holders serve also as contacts for transmitting electric current supplied by water-cooled cables (tubes). The electrode and the scrap form the star connection of three-phase current, in which the scrap is common junction.
- The furnace is mounted on a tilting mechanism for tapping the molten steel through a tap hole with a pour spout located on the back side of the shell.

- The charge door, through which the slag components and alloying additives are charged, is located on the front side of the furnace shell. The charge door is also used for removing the slag (de-slagging).
- The scrap is charged commonly from the furnace top. The roof with the electrodes is swung aside before the scrap charging.
- The scrap arranged in the charge basket is transferred to the furnace by a crane and then dropped into the shell.

Ladle Furnace

- The Molten Steel Ladle shall be transferred to a Ladle Car for carrying out secondary refining in the Ladle Furnace.
- The Ladle has a porous refractory plug at the bottom to purge Argon gas to keep the molten metal in vertical stirring movement.
- The Ladle is covered by a water cooled roof which has openings for three graphite electrodes, a fume outlet connected to FES system and a door for charging fluxes & alloying elements. Electric heating is done by arcing under the reducing slag.
- Lime is used as flux for refining the steel.
- Ferro Alloys are added to achieve de-oxidation and required composition of steel.

Aims of LF Treatment are:

- De-sulfurization of steel
- De-oxidation of steel
- Inclusion removal to slag by floating through argon purging.
- Achieving right composition and temperature required for casting at CCM.
- Act as a buffer for achieving sequence casting.

Billet Caster (6 / 11 m radius, 3 strand)

- Liquid Steel Ladle after Ladle Furnace secondary refining will be taken to the Continuous Casting Machine. The Ladle is raised and placed onto a ladle stand above the Tundish. Liquid metal flows out of the Ladle Slide gate into the Tundish and then into the water-cooled oscillating copper mould. Solidification begins in the mould, and continuous through the secondary water spray cooled zone having strand guide rollers. The strand is then straightened by withdrawal rolls, torch cut and then discharged for intermediate storage or hot charged for rolling.
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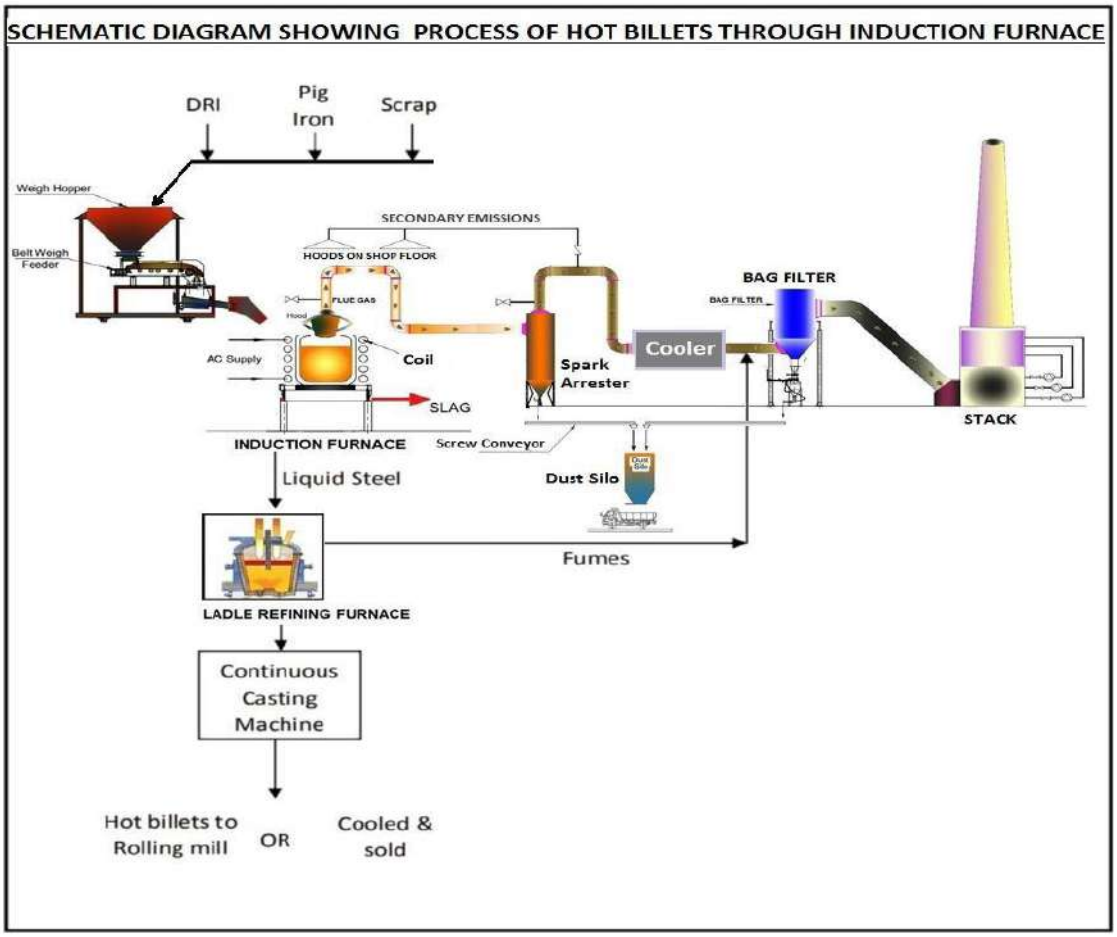


Process Flow of Steel Making through SMS

5. PROCESS: ROLLING MILL

In the proposed rolling mill, TMT Bars and Wire Rods will be produced using billets. The feed stock of the rolling mill will be Billets. Hot charging of billets is considered to achieve economy by considerable saving in fuel requirement and air emissions as compared to using of reheating furnace to reheat the cooled Billets and also improved yield compared to reheating furnace.

A provision will be made for installing reheating furnace for emergency used due to any Break Down / Shut down in the production line in the rolling mill. The reheating furnace will be pusher type and furnace oil will be used as the fuel. Provision will also be made for Induction Heater to increase grade of carbon steel if required during wire rod production.

Advantages of Hot charging of Billets for Rolling:

- Energy conservation by eliminating the cooling of hot metal and making of Billets.
- Energy conservation as Reheating of Billets is eliminated
- No requirement for reheating furnace. Hence fuel conservation.
- As no reheating furnace and no fuel, there will be no air emissions from the fuel burning.

6. FERROALLOY PLANT

Ferro Alloys are made by smelting process. Smelting of charged material is carried out in Submerged Electric Arc Furnace equipped with transformer of proper ratings. Ferro Alloys are produced by reducing metals from their Oxides contained in Ore by using a suitable reductant under conditions created to ensure a high recovery of the valuable material.

Smelting Procedure

The charge of smelting Ferro Alloy is made up with the mixture of Manganese Ore, reductant & Dolomite. The charge is loaded into the furnace from charging apparatus which essentially is an electrically driven carriage on monorail. The carriage has loading chute. Coke Breeze is first loaded from furnace bins to the charge apparatus, followed by ore. This sequence of charging ensures more thorough mixing of the charge & prevents sticking of moist ore fines to the wall of charging apparatus. In order to prevent separation of the charge into components, the entire bath is poured into a pile on the charge & a specific amount of dolomite is added to it. After that the piles are gathered into cones around the electrode.

The charging apparatus can deliver the charge only to the front side of electrode. The material is pushed to rear side electrode by means of long rabbles & are partly thrown by shovels from piles prepared on the working stage at the rear corner of the furnace. Charging is continued as the material settle down at the electrodes. A cone around an electrode should be 300 – 400 MM above the charging level. The electrodes are maintained at a depth of 1100 – 1400 MM with their ends being spaced 600 – 800 MM from the furnace bottom. Owing to deep pressing of the electrodes the high temperature zone is covered with a layer of charge 800 – 1000 MM thick. The spacing between the electrodes & furnace bottom prevents overheating of the metal & evaporation of manganese.

The use of dry ore & coke breeze ensures a high productivity, lower consumption of electric energy, stable process conditions & better labor conditions. With a deficiency of reductant in the charge, manganese cannot be reduced fully & the content of manganese oxide in the slag & that of phosphorus in the metal increase. With a large excess of reductant, the content of silicon in the metal increases, the metal & slag are tapped successively from all the two tap holes the slag ratio in the smelting of Ferro Alloy by a flux less process is within 1.0 to 1.2. The slag is separated from metal during tapping by means of skimmer arrangement. Modules are arranged in a cascade

under the spout, a partition is placed into the first mould, with its lower edge 60 – 70 MM below the pouring nose of the mould. Slag is retained by the partition & flows over into the ladle while.

Ferro Manganese Manufacturing Process

Ferro Manganese is produced from manganese ore, which have the principle constituents of manganese in the form of oxides balance usually being Iron, Aluminum, Magnesium oxides & silica. For making Ferro Manganese, coke is used as reductant & flux like limestone or dolomite are added to the reaction mixture The electrodes in SAF are immersed into the solid charge The Furnace is recharged as the solid is being smelted & the alloy & slag are periodically removed.

Chemical Composition of Fe-Mn

- Mn 70-75%
- Si 1.5%.
- C 6-8% Max.
- P 0.04% Max.
- S 0.05% Max.

Silico Manganese Manufacturing Process

Silico Manganese is an Alloy of Manganese with Silicon and Iron. Silico Manganese is also employed as a complex de-oxidant in steel making and (upon melting together with Aluminum) to produce a complex Manganese- Silicon-Aluminum de-oxidant. The process for smelting Silico Manganese essentially contains in manganese & silicon being simultaneously reduced from manganese silicate, slag, ore & quartzite, The process relies on a higher temperature than that needed for smelting Ferro-Manganese. The process is carried out continuously under slag having a ratio 1:1. Charging & Furnace top maintenance are done essentially in the same way as in Ferro Manganese. The metal & slag are tapped from the furnace every two hours, through same tap hole in a similar way to Ferro Manganese.

Chemical Composition of Si-Mn

- Mn 60-65%
- Si 13-15%
- C 2.5% Max.
- S &P 0.03% Max

Ferro Silicon Manufacturing Process

The blend of raw material is charged to furnace with low voltage & high current is pass through the electrodes. As the process of Ferro Alloy is continuous, the charge is feed at continue intervals through hopper & charging chutes into the Furnace hearth whenever the charge levels comes down. Inside the Furnace the basic Ore is subjected to oxidation at the high temperature between 1500 – 1750 deg C & reduced through the Coke. The fluxes are used to maintain the basicity in order to maintain required temperature & fluidization of Slag. The molten Ferro Alloys & the slag

is tapped at regular intervals and are casted as cakes in large cast iron casting pan. After proper solidification of these cake they are shifted to metal handling yard for crushing, sizing, lot preparation, lot sampling, lot analysis, lot packing, lot stacking & allotting lot number for proper identification to meet market requirement of domestic as well as overseas.

Chemical Composition of Fe-Si

- Si 70-75%
- C 7-8%
- S 0.05%
- P 0.04%

The raw materials are mixed at a desired proportion in a weigh hopper and charged into the furnace through charging tubes. Input of electrical energy through Soderberg electrodes cause generation of heat energy, as the charge is having definite resistance.

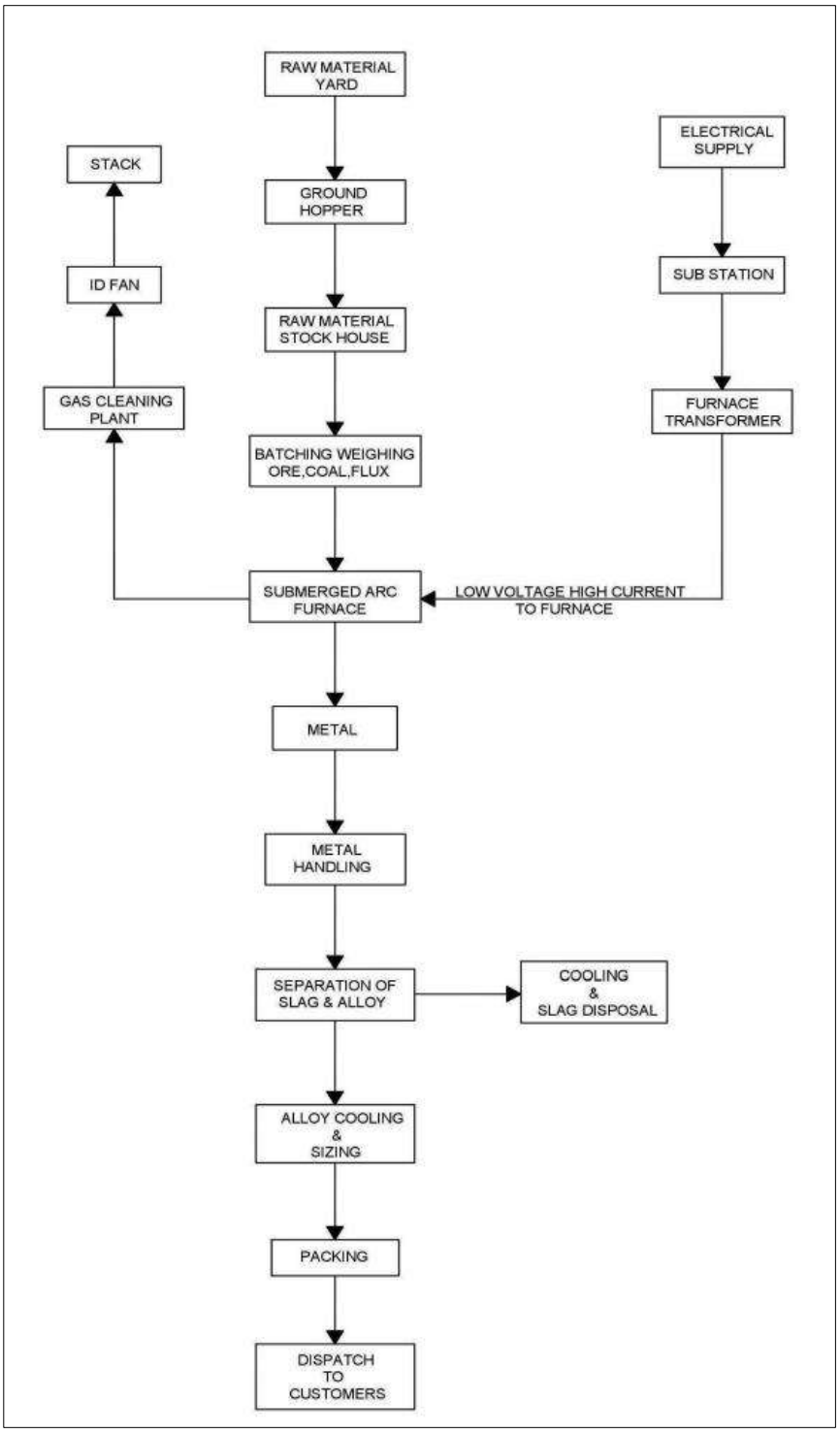
Due to evolved heat, smelting of charges (Manganese / Silicon etc.) takes place according to the following chemical reactions: -

$MnO + 2C \text{ === > } Mn + 2CO$

$SiO + 2C \text{ === > } Si + 2CO$

$2CO + O2 \text{ ==== > } 2CO2$

The respective ores and reducing agent (Carbon) is having gangue material like $SiO2$, CaO, MgO etc. Addition of fluxes makes the reaction exothermic which ultimately removes the gangue material present in ore & reductants.



Process Flow of Ferroalloy Plant

Plant Facilities -

Raw Material Receipt & Storage Yard –

The raw material like Manganese Ore, Coke, Coal, Quartz, Dolomite etc. will be received by trucks & stacked separately in stock yard. The material will be procured in required size range & quality. These raw material is stored in concrete yard. Coke & Coal is stored in covered area.

Raw Material Handling System

The raw material shall be feed to Ground Hopper by dumper & pay loader. The material will be transferred from Ground Hopper by a belt conveyor system to storage bunkers.

The raw material will be mixed as per the material balance shall be weighed by weighing hoppers. The weigh hoppers shall be provided with suitable load cells to record the weight of each raw material that from the recipe of the material mix. The material after weighing in the required proportion are conveyed through a belt conveyor, monorail to the furnace top where charging hopper is provided right on the top of the Furnace Shell. The charging hoppers are connected with charging chutes & slide gates through which the material is fed into the Furnace around the three electrodes as & when required. The slide gates are operated pneumatically for which a suitable air compressor shall be provided. The entire weighing & feeding system is controlled through an Automatic Bath weighing system.

Submerged Arc Furnace

For smelting the raw material, the Submerged Arc Furnace of 3 x 16.5 MVA capacity will be installed. The shell is lined with fire clay bricks followed by silicon carbide bricks. The Furnace shell is externally water cooled by spray nozzles.

- In addition to Furnace Shall, water cooling system shall be provided for –
- Cooling of current conducting bus tubes & copper clamps.
- Electrode holding pressure rings.

Hot Metal Handling

There are two nos. of tap holes provided in the Furnace shell to take out the metal & slag from the Furnace at regular intervals of about every two hours. The hot liquid metal & slag are collected into cast iron moulds. The slag by virtue of its lesser specific gravity floats on the metal & overflows into cast iron slag pot & the metal is retained in CI Moulds. The liquid slag is poured out into stand beds for solidification & the metal is allowed to solidify in the CI Moulds itself 1 No. 10 Tons capacity heavy duty EOT Crane will be installed in the tapping bay to facilitate the hot metal handling. After solidification metal & slag are removed from the moulds/stand beds & sent to braking yards sizing into customer required size. This metal is than sent to packing section & the slag is sent to dump yard.

7. CAPTIVE POWER PLANT (AFBC & WHRB)

Captive Power Plant (Proposed)			
	MW	**Fuel**	**Boiler**
WHRB	10 45	Waste heat from 2200 TPD DRI Plants	10 TPH x 4 nos. 70 TPH x 3 nos.
AFBC (Air Cooled) (2 x 27.5 MW)	55	Dolochar from DRI Plant + Coal Fines	125 TPH x 2 nos.
Total MW	**110**		

WHRB Boiler

The power plant shall generate power from the waste which shall emanate from the operations of the proposed sponge iron kiln.

During the process of reduction of iron ore in the rotary kilns substantial quantity of hot gases are generated. These hot gases are envisaged to be used in raising steam in a waste heat recovery boiler to generate power. This hot and dust laden gas from the kiln has to be cooled and then cleaned before discharging through the stack, to comply with the precipitator (ESP) and waste gas exhaust fans are installed in the exhaust gas circuit ahead of the stack to clean and exhaust the gas through stack. Before the waste gas can be admitted into the ESP, its temperature of about 1000 ^{0}C is to reduce to about 140^{0}C. The significant amount of the sensible heat contained in the waste gases when gainfully recovered would improve the economies of operations. Accordingly, these hot gases are used in raising steam in a Waste Heat Recovery Boiler which is to be used for generation of power through Turbo Generator Sets.

Waste Heat Recovery Boiler, which is a natural circulation, single drum, top supported vertical type unit suitable for balanced draft operation is located at the downstream of the combustion chamber.

The Waste Heat Recovery Boiler (WHRB) will be equipped with all associated auxiliaries such as de-rater and feed water storage tank, boiler feed pumps, chemical dosing system equipment, soot blowers, ductwork, integral pipe work, refractory and thermal insulation.

Boiler pressure ports and the gas passed are suitable arranged for effective heat recovery from the high temperature kiln waste gases. Suitable hoppers are also provided at the end of the passes to collect dust particles that to be separated from the waste gases. The boiler unit is equipped with instrumentation and control system and electric auxiliaries. The cooling water required for the sample coolers and cooling of the boiler feed water pumps is drawn from the main cooling water grid of the plant.

For generation of power from the steam, turbo generators for generating (26 x 2) MW of power shall be installed. It is a single cylinder, axial flow, condensing machines with impulse reaction blades and two bleed system points to meet the heating steam requirements of the darter in WHRB and the low pressure feed water heated in the condensate circuit.

The TG set is equipped with all associated equipment and sub systems such as lubrication and control oil system, condenser, cooling water system, condensate extraction system and condensate heater.

Main steam supply to the turbine will be through a common steam header from the Waste Heat Recovery Boiler unit. Condensate from each condenser is returned to a common de-aerator through a common header.

Cooling water supply required for the Turbine Generator condenser is derived from the plant cooling water grid.

AFBC Boiler

AFBC means atmospheric fluidized bed combustion, where the furnace pressure is atmospheric pressure. Atmospheric fluidized-bed combustion (AFBC) boilers offer efficient, cost effective and reliable steam generation. AFBC technology promises to provide a viable alternative to conventional coal-fired and other solid fuel-fired boilers.

AFBC boiler is a very developing technology now-a-days. This technology is widely used in the industrial boiler for the purpose of efficient and clean burning of coal and other fuel for steam generation. AFBC boiler is suitable for combustion of low quality fuel

- In AFBC boiler fluidization bed, combustion is method of burning of solids fuel in which the fuel is continuous fed into hot fluidized bed of inert bed material.
- Inert fluidized bed is heated to the ignition temperature of fuel and fuel is supplied continuously into the bed.
- The fuel burn rapidly and the bed attain a uniform temperature. In AFBC boiler combustion is take place at about 850- 950 degree Celsius.

Air Pollution Control System

M/S Jai Balaji Jyoti Steels Limited will ensure that the proposed power plant causes no adverse impact on the area. The proposed project is planned to meet all environmental norms and further improve the environs in the area.

- Air pollution control system (APCS) comprising of Electro-static Precipitator with all its accessories for the boiler will be provided. The APCS will be designed to provide an outlet dust concentration less than 30 mg/Nm3, with the boiler operating with the range of fuel properties indicated.
- The ESP will be designed to provide an outlet dust concentration level of 30 mg/N.Cu.m with all field in service, with the FBC boiler operating with the design basis as specified for the worst operating condition of the fuel composition mentioned and overall dust collection efficiency 99.93% with all field in service.
- The aspect ratio of the ESP (electrode zone) will be optimally selected, so as to minimize re-entrainment and carryover of the collected dust, and for assured ESP performance.
- SO2 emissions will be controlled by the proposed Flue Gas Desulphurisation (FGD) system to reduce SO2 emission from flue gases from Coal fired boiler. The Scrubbing shall be done through scrubbing tower with Limestone.
- In addition to above, for coal handling system dedicated bag filters will be installed to restrict emission less than 30 mg/nm3.

3.6 Raw Material required along with Estimated Quantity, Likely Source, Marketing Area of Final Products, Mode of Transport of Raw Material & Finished Product.

❖ **Beneficiation cum Pellet Plant (Pellet Production)**

Raw Materials	Quantity Consumption TPA	Source
Iron Ore Fines	1920,000	Mines in Odisha, by road and rail
Limestone	33000	Rourkela, by road
Bentonite	15000	Kutch, by road and rail
Coal for Gasifier & PCI	100000	Mines in Odisha, by road and rail

❖ **For proposed DRI Plant (Sponge Iron) [3x 600 TPD = 594000 TPA]**

Raw Materials	Tons / Year	Source & Transportation
Pellet	891000	In house production
Coal	730620	Mines in Odisha by Rail/ Road
Dolomite	17820	Mines in Odisha By Rail/Road

❖ **SMS Unit (Billets Production)- Induction Furnace [4x20 T]**

Raw Materials	Quantity Consumption TPA	Source
Sponge Iron	237,600	In House Production
Pig Iron	40,392	Rourkela by road
MS Scrap	27,720	Rourkela by road

❖ **SMS Unit (Billets Production)- Electric Arc Furnace [1x20 T]**

Raw Materials	Quantity Consumption TPA	Source
Sponge Iron	59,400	In House
Pig Iron	10,098	Rourkela by road
MS Scrap	6930	Rourkela by road
Fe Alloys	792	Inhouse

❖ **Ferroalloy Plant (FeMn Production)- Submerged Arc Furnace [3x16.5 MVA]**

Raw Materials	Quantity Consumption TPA	Source
Mn Ore	274428	Mines in Odisha by rail & road
Coal	30243	Mines in Odisha by rail & road
Coke	43684	Purchased, by rail & road
Dolomite	16802	Mines in Odisha by rail & road

ALTERNATE

❖ **Ferroalloy Plant (FeCr Production)- Submerged Arc Furnace [3x16.5 MVA]**

Raw Materials	Quantity Consumption TPA	Source

Cr Ore	168017	Mines in Odisha by rail & road
Coal	9334	Mines in Odisha by rail & road
Coke	33603	Purchased, by rail & road
Quartzite	9000	Mines in Odisha by rail & road

❖ **Power Plant (AFBC Boiler)- [2x27.5 MW]**

Raw Materials	Quantity Consumption TPA	Source
Dolochar	158400	Inhouse generation
Coal	**200000**	Mines in Odisha by rail & road

3.7 Resource Optimization/ Recycling and Reuse Envisaged in the Project, if any, should be Briefly Outlined.

Proposed project will have close circuit water circulation system so that no effluent is discharged in the open outside the plant boundary. All the process effluent will be collected in the thickener. Settled slurry of the thickener will be dewatered in the Multi Roll Belt Press Filter. The dewatered filter cake will be mixed with middling for use as fuel for the power plant. The clarified water from thickener overflow will be re-circulated to the plant for use as process water. Only make up water requirement will be added in the clarified water tank.

Since the plant will be designed with close circuit water system as described above, no tailing dam will be required for treated the process effluent / tailings. However, a set of cascading type emergency settling pond will be constructed within the plant boundary to take care of any unforeseen situation like pipe line jamming or break down of thickener. The clarified water from these emergency settling ponds will also be pumped back to the plant for use as process water. Imported equipment like centrifuge, belt press filter, high frequency screen as well as thickener will be installed to ensure close circuit water system and also to minimize loss of water through products, evaporation losses and conserve this precious natural resource.

3.8 Availability of Water, Its Source, Energy/ Power Requirement and Source.

Source of the water will be Surface Water from Brahamani river.

Requirement of additional water for Expansion Project: 7510 KLD

Source of Electricity: Captive Power Plant (State Electricity Board for shortfall)

Emergency Power: 2 x 500 KVA DG sets

3.9 Quantity of Wastes to be Generated (Liquid and Solid) And Scheme for their Management/Disposal.

100% of waste water will be treated and recycled / reused within the plant premises. Zero liquid discharge condition will be maintained.

Water Consumption and Wastewater Generation and Management

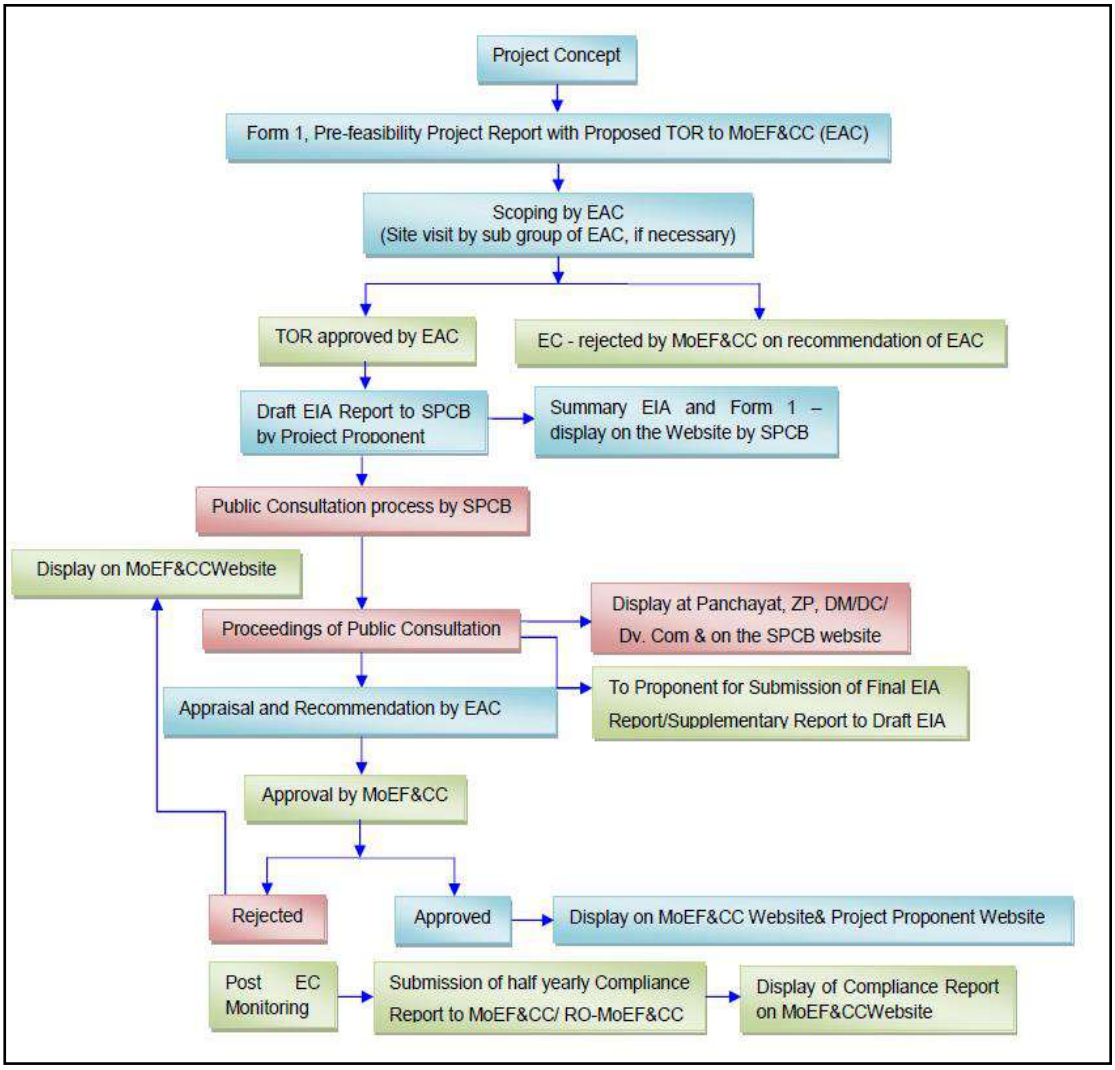
Name of the Units	WATER BALANCE			Wastewater Management Scheme	
Units	Existing (m3/day)	Proposed (m3/day)	Total (m3/day)	Wastewater Generation (m3/day)	Disposal/ Reuse scheme
DRI Plant	350	1200	1550	150	CT b/d taken to settling tank and reused for cooling
IF Based SMS with Caster	270	580	850	85	CT b/d taken to settling tank and reused for cooling
Coal Washery	50		50	10	Treated in ETP and reused for coal washing
Electric Arc Furnace with Caster		125	125	12.5	CT b/d taken to settling tank and reused for cooling
SAF with Briquette		500	500	50	CT b/d taken to settling tank and reused for cooling
Rolling Mill		400	400	40	Wastewater is taken to scale pit & Oil separator. After treatment the water is reused for cooling
Captive Power Plant		3450	3450	345	Wastewater streams will be segregated for treatment. After treatment the water will be reused for ash and coal dust suppression
Iron Ore Beneficiation cum Pellet Plant with Gasifier		1000	1000	100	CT b/d taken to settling tank and reused for cooling. Effluent from gasifier will be fired in DRI Kiln
Misc and domestic use	12	255	267	70	Taken to STP and reused for gardening
TOTAL	**682**	**7510**	**8192**	**ZLD will be maintained**	

Solid wastes Generation and Management

SL. No.	Unit	Name	Quantity	Utilization
1	Pellet Plant	Tailing	320000 TPA	Will be reused in cement plant, construction and landfilling purpose
2	DRI Plant	DRI Char	158400 TPA	Will be reused as fuel for power generation after mixing with coal.
3	SMS	Slag	52800 TPA	Will be crushed and metal recovery will be done. Thereafter the crushed slag will be reused for cement making, road making and other construction purpose.
4	Ferroalloy Plant	Slag	88676 TPA	
5	CPP	Fly Ash & bottom Ash	150000 TPA	Used as per MOEF Notification (will be used to fill up mine voids, making embankments, making brick, block and tiles and used in other construction purposes)

3.10 Schematic Representations of the Feasibility Drawing which give information of EIA Purpose.

Environment Impact Assessment and Environment Management Plan is an important tool in achieving the sustainable development of the project. The process is depicted below:-

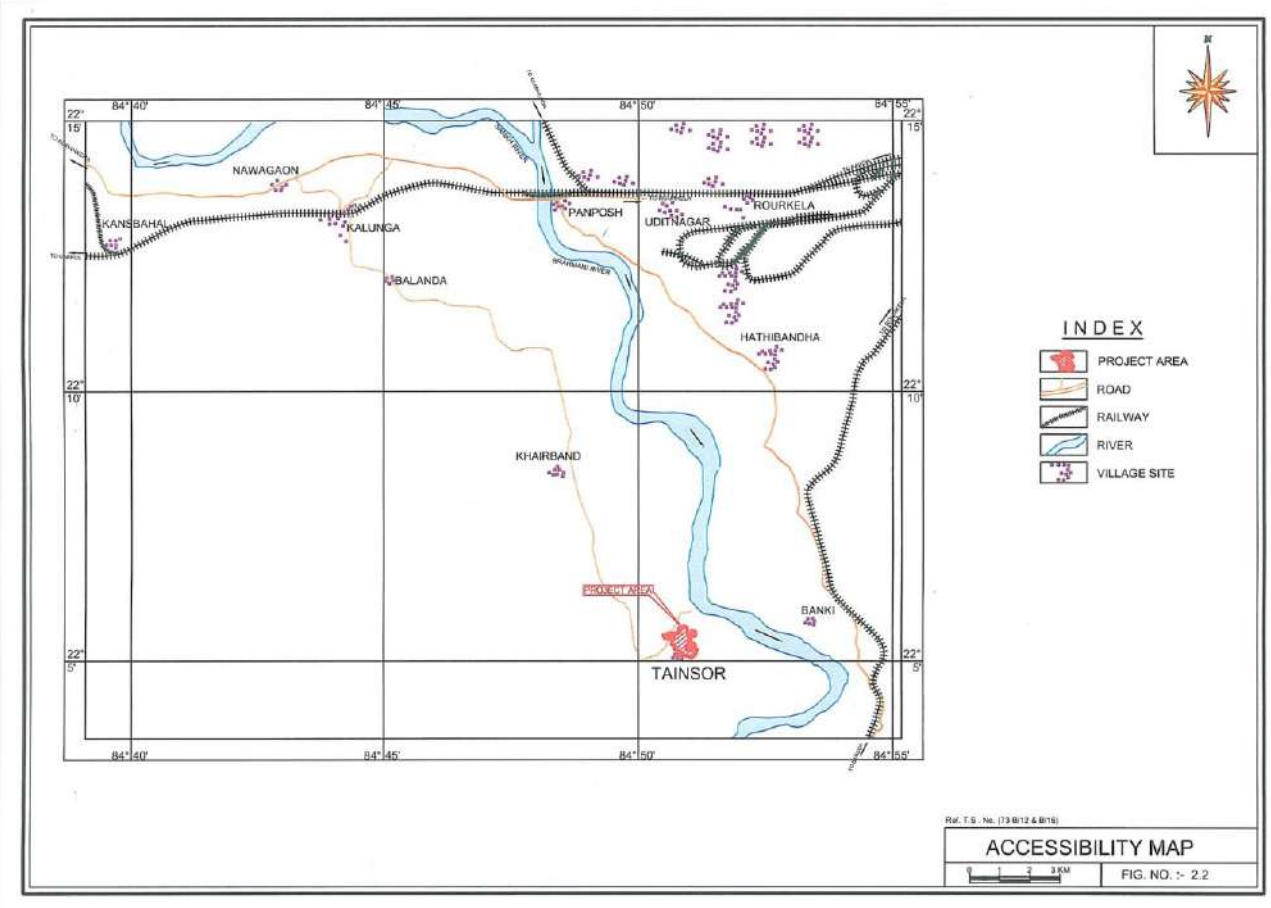


CHAPTER-04
SITE ANALYSIS

4.1 Connectivity

The existing site has all the facilities for the proposed project. Also it has good connectivity with road.

- **Road Connectivity:** Approached from Rourkela by Katunga- Gurundia road (20 km). National Highway-23 is at 2.5 km towards NE direction.
- **Rail Connectivity:** The nearest railway station is Champajharam Railway Station (SE) at 17 km by road towards South-East. Rourkela Railway Station is at a distance of 26 km by road towards north direction.
- **Nearest Airport:** Jharsuguda Airport is 100 km towards west



4.2 Land Form, Land Use and Land Ownership.

Total land area of the existing premise is 89.67 Acres. The tentative land area statement of proposed project is given as below-

Available Land

Purchased	89.67	Acres
Plant Area	60.00	Acres
Green Belt	29.59	Acres

Landuse Break up

Existing + Proposed Unit	Existing	Proposed	Total
DRI Plant	4.5	8.0	12.5
IF Based SMS with Caster	2.0	4.0	6.0
Coal Washery	1.5	-	1.5
EAF with LRF, AOD, Caster	-	2.0	2.0
SAF with Briquette Plant	-	6.5	6.5
Rolling Mill	-	4.0	4.0
Captive Power Plant	-	8.0	8.0
Iron Ore Beneficiation	-	7.0	7.0
Pellet Plant with Coal Gasifier	-	5.5	5.5
Roads & Utilities	2.0	5.0	7.0
Plant Area	**10.0**	**50.0**	**60.0**
Green Belt	5.0	25.0	**30.0**
Total Area	**15.0**	**75.0**	**90.0**

4.3 Topography (Along with Map)

The site falls in the survey of India toposheet No. 73 B/16. The land within the existing remises is flat without any undulations and partly sloping towards North-East. Due to proposed project, there will be minor topographical changes due to the excavations, construction activities pertaining to the project.

4.4 Existing Land Use Pattern (Agriculture, On-Agriculture, Forest, Water Bodies (Including Area Under CRZ), Shortest Distances from The Periphery Of The Project To The Periphery Of The Forests, National Park, Wild Life Sanctuary, Eco Sensitive Areas, Water Bodies (Distance From The HFL Of The River), CRZ In Case Of Notified Industrial Area, A Copy Of The Gazette Notification Should Be Industrial Area A Copy Of The Gazette Notification Should Be Given.

The existing area of 89.67 acres land is already acquired and under the possession of the company where the existing manufacturing facility is under operation.

Land-use Pattern.

Current land use is industrial.

List of the Reserve Forests present in Buffer Zone: -

- South Champajharan Reserve Forest -at an aerial distance of 3.1 Km on SE.
- Mahura Reserve Forest - at an aerial distance of 8.5 Km on SE Direction.
- Jharabherha Reserve Forest - at an aerial distance of 9.7 Km on SE.
- North Champajharan Reserve Forest- at an aerial distance of 3.1 Km on SE.
- Kuchaita Reserve Forest - at an aerial distance of 5 Km on E Direction.
- Hathiarha Reserve Forest - at an aerial distance of 6.6 Km on East.
- Ergerha Reserve Forest - at an aerial distance of 6.6 Km on NE.
- Lathkata Reserve Forest - at an aerial distance of 5.3 Km on NE.
- Hathibandha Reserve Forest - at an aerial distance of 7.8 Km on N.
- Butukupiri Reserve Forest - at an aerial distance of 8.9 Km on NW.
- Rutukupiri Reserve Forest - at an aerial distance of 9.6 Km on NE.
- Barhamaren Reserve Forest - at an aerial distance of 7.9 Km on NE.
- Bhaishamunda Reserve Forest - at an aerial distance of 7.3 Km on SW.
- Kusumadihi Reserve Forest - at an aerial distance of 8.3 Km on SW.
- Rangamati Reserve Forest - at an aerial distance of 4.7 Km on SW.
- Dhenkiam Reserve Forest - at an aerial distance of 7.1 Km on SW.

List of the Protected Forests present in Buffer Zone: -

- Bariberha Protected Forest - at an aerial distance of 8.7 Km on NE.
- Karalakhaman Protected Forest - at an aerial distance of 7.7 Km on NE.
- Kanarasuan Protected Forest - at an aerial distance of 8.8 Km on NE.
- Dhenkiam Protected Forest - at an aerial distance of 5.2 Km on NE.

List of the Water bodies present in Buffer Zone-

- Brahmani River –at an aerial distance of 0.4 Km on NE Direction.
- Suidihi River - at an aerial distance of 5.8 Km on N Direction.
- Chandari Nadi - at an aerial distance of 2.8 Km on NW Direction.
- Hathiburha Nala /Drain - at an aerial distance of 9.4 Km on NE Direction.
- Champajharan Nala/Drain - at an aerial distance of 3.4 Km on SE.
- Chandari Nala /Drain - at an aerial distance of 2.8 Km on NW Direction.

"No national park/Wild life sanctuary present within the 10 km radius of the project site"

4.5 Existing Infrastructure.

Approach Road, Boundary wall, Administrative office, Gate, water intake structure in Brahmani river and pipelines till plant, water reservoir, greenbelt, truck parking area available inside the plant premises.

4.7 Climatic Data from Secondary Sources.

The area has a tropical climate and receives high rainfall during Southwest monsoon (June – September) and retreating Northeast monsoon (December – January). Average annual rainfall ranges between 160 and 200 cm.

4.8 Social Infrastructure Available.

The district is bounded by Ranchi District of Jharkhand on the North, Raigarh District of Chhattisgarh on the west and North West, Jharsuguda, Sambalpur and Angul Districts of Odisha on the South and South East and Singhbhum District of Jharkhand and Keonjhar District of Odisha on the east.

Sundargarh is recognized as an industrial district in the map of Odisha. Steel Plant, Fertilizer Plant, Cement factory, Ferro Vanadium Plant, Machine building factory, Glass and china clay factory and Spinning mills are some of the major industries of this District. Sundargarh occupies a prominent position in the mineral map of Odisha and is rich in iron ore, limestone, manganese, dolomite, and fire clay. Major industries are the Odisha Cements ltd, Hart Fertilizers Ltd, and Odisha Industries Ltd. The industrial town of Rourkela in this district has the first government sector plant built with foreign collaboration and was the first in India to use LD oxygen technology.

There are several hospitals, schools, places of worship and community facilities within 15 Km radius of the project site.

Hospitals

- Birkera Govt. Hospital - at an aerial distance of 5.8 Km in NW.
- Super Speciality Hospital - at an aerial distance of 16 Km in NW.
- Jaiprakash Hospital & Research Center Pvt. Ltd. - at an aerial distance of 16.2 Km in NW.
- ESIC, Model hospital - at an aerial distance of 16.3 Km in NW.

Schools

- Tainsar High school - at an aerial distance of 1.3 Km in West.
- Chinmaya School - at an aerial distance of 17.2 Km in North West.
- Biju Patnaik University of Technology, Rourkela - at aerial distance of 16.28 Km in NW.
- Kanak Manjari International School - at an aerial distance of 17.53 Km in North West.
- Kendriya Vidyalaya - at an aerial distance of 17.77 Km in North.

Community Facilities

- Jalda Mini Stadium - at an aerial distance of 9.1 Km in North.
- Dhanwantary Organic Garden - at an aerial distance of 5.34 Km in SE.

CHAPTER – 05
PLANNING BRIEF

5.1 Planning Concept (Type of Industries, Facilities, Transportation etc.) Town and Country Planning/Development Authority Classification.

Proposed project activities will be started after getting statutory clearance form related authorities. The project will be completed in 2022-2023. Further proposed project activities will be carried out in compliance with all the rules and regulation of statutory authority and provide the control measure and devices to achieve the standard norms.

5.2 Employment & Population Projection

The industry will provide employment to about 1900 peoples. Since the plant is located near Rourkela industrial town, trained manpower is already available. Preference in employment will be mostly given to local people. Therefore, there will not be any substantial increase in the population of local villages. However, population concentration may increase around the project site due to increase in ancillary activities.

5.3 Land Use Planning (Breakup along with Green Belt etc.)

Total land is 89.67 acres. This land is sufficient for the setup of the proposed project. Approx. 33.45% land has been earmarked for plantation and greenbelt as per standard norms. Table below gives the % area used in the plant. The tentative land area statement of proposed project is given as below: -

Existing + Proposed Unit	Existing	Proposed	Total
DRI Plant	4.5	8.0	12.5
IF Based SMS with Caster	2.0	4.0	6.0
Coal Washery	1.5	-	1.5
EAF with LRF,VOD, Caster	-	2.0	2.0
SAF with Briquette	-	6.5	6.5
Rolling Mill	-	4.0	4.0
Captive Power Plant	-	8.0	8.0
Iron Ore Beneficiation	-	7.0	7.0
Pellet Plant with Gasifier	-	5.5	5.5
Roads & Utilities	2.0	5.0	7.0
Plant Area	**10.0**	**50.0**	**60.0**
Green Belt	5.0	25.0	**30.0**
Total Area	**15.0**	**75.0**	**90.0**

5.4 Assessment of Infrastructure Demand (Physical & Social)

- The proposed project is planned with the existing manufacturing plant premises. Hence, no substantial additional infrastructure is required. The available road network and natural sources of water supply and drainage system are adequate;
- Raw water will be sourced from the Brahamani River. Necessary permission from the State Water Resource Department has been obtained.
- It is proposed to adopt rain water harvesting practice within industrial premises.
- Power will be sourced from CPP.
- The DG sets will be installed for emergency backup supply to meet the contingencies of power cut and power failure. Thus no additional emergency arrangement is required;
- There is no other major infrastructural requirement for the project.

5.5 Amenities / Facilities

The necessary arrangement for proposed expansion project for meeting water supply for drinking purposes, toilet facilities for workers as well as inward/outward transport operators, parking facilities, as well as small canteen for workers and guests will be provided. The STP will be built for disposal of domestic effluent generated. A canteen with rest room is already available for the supply of tea; snacks; food to the workers and drivers, visitors etc. Sufficient parking space is provided for parking of Trucks; cars etc.

CHAPTER – 06
PROPOSED INFRASTRUCTURE

6.1 Processing Area – Industrial Use

Out of the total 89.67 acres area, about 53 Acres land will be under plant and remaining area will be under utilities, open space as well as road development, water storage and green belt development etc. as given in land use statement.

6.2 Residential Area (Non-Processing Area)

There is no proposal of any residential colony as the required manpower will be sourced from local areas. Few highly skilled posts may be filled from outsiders for whom houses will be leased in nearby residential area. Non-processing area will comprise of facilities within the premises such as –administrative block, road & pollution control equipment area etc. Other social infrastructure like housing, schooling and medical facilities area already developed in nearby area, hence, no residential colony/township is envisaged for employees.

6.3 Green Belt

A greenbelt has already developed which will be further enhanced with the implementation of the proposed project. Total green belt & plantation area shall be 30 Acres The main objective of the greenbelt is to provide a barrier between the plant and the surrounding areas. Tree density of 2500 trees per hectare with local board leaf specification will be planted. Local species with good survival rate will be selected.

6.4 Socio-Economic Benefits & Social Infrastructure

The existing infrastructure facility is adequate in the proposed project site. The social infrastructure like school, college, temples and hospitals already exist in this area. The above infrastructure facilities need no further development for the project nor is any major change in the infrastructure envisaged due to the project. Only direct and indirect employment generation is envisaged.

6.5 Connectivity (Traffic and Transportation Road/Rail/ Metro/ Water Ways etc)

The area is well connected by road to the Rourkela industrial town [20 km] by Katunga-Gurundia road. National Highway-23 is at 2.5 km towards NE direction. Rail Connectivity: The nearest railway station is Champajharam Railway Station (SE) at 17 km by road towards South-East. Rourkela Railway Station is at a distance of 26 km by road towards north direction.

6.6 Drinking Water Management

The raw water will be sourced from Brahamani River. The raw water treatment plant will be provided at the site. The maximum demand of raw water during post expansion phase has been estimated to be 8192 KLD. Out of which, domestic water demand will be 90 KLD.

6.7 Sewerage System

The project will involve about 1,900 people employment on three shift basis. However, around 250 people additionally may be visiting in project site as truck drivers or cleaners or visitors etc. thus considering 2,150 people daily disposing the domestic effluent, Domestic effluent collected through toilet blocks and other areas will be collected through well designed sewer network and send to STP for the treatment. Treated effluent will be recycled in the green area.

6.8 Industrial Waste Management

Industrial waste from proposed expansion project will be utilized for various beneficial purposes as per norms.

List of Air Pollution Control Equipment:

SL.No	Unit	Air Pollution Control equipment	PM Emission Level
1	Pellet Plant	ESP & Bag filters	<30 mg/NM^3
2	DRI Plant	ESP and Bag Filters	< 30 mg/NM^3
3	SMS Unit	FES and Bag Filter	<30 mg/NM^3
4	CPP	ESP and Bag Filter	<30 mg/NM^3
5	SAF	4th Hole extraction system on covered hood connected to Bag Filter	<30 mg/NM^3

CHAPTER – 07
REHABILITATION AND RESETTLEMENT (R & R) PLAN

7.1 Policy to Be Adopted for R & R Plan with Respect To Project- Not Required

There is no displacement of any houses, habitation or livestock. Thus, the project does not require any R & R plan.

CHAPTER – 08
PROJECT SCHEDULE & COST ESTIMATES

8.1 Likely Date of Start of Construction and Likely Date of Completion (Time Schedule for the Project to be given).

The industry will take necessary approvals from the consented authority and start the construction immediately after obtaining Environmental Clearance.

Statutory Clearances

The proposed project will require various statutory approvals and clearances from various authorities of the Government. Clearances required for the proposed project are identified and necessary action initiated to obtain the same.

Project Schedule

The project construction work is likely to be started immediately after obtaining the Environment Clearance and will take 5 years (60 months) to complete it. However, the dates cannot be forecasted and thus the schedule of implementation is worked out from zero date to progressive time required in months.

8.2 Project Cost

The overall estimated project cost for the proposed unit is INR 1485 Crores

Proposed Unit	Configuration	INR (Cr)
DRI Plant	3x600 TPD	275
IF Based SMS with Caster	4 x 20 TPH	40
Electric Arc Furnace with LRF, AOD and Caster	1 x 20 TPH	25
SAF with Briquette Plant	3 x 16.5 MVA	125
Rolling Mills (TMT Bar and Wire Rods)	0.43 MTPA	150
Captive Power Plant (WHRB and AFBC)	110 MW	400
Iron Ore Beneficiation, Pellet Plant & Gasifier	2 x 0.8 MTPA	420
Utilities and Misc	-	50
TOTAL		**1485**

Note: Pollution control cost is approximately 8.65% of the project cost

CHAPTER – 09
ANALYSIS OF PROPOSAL

The proposed expansion project will be beneficial to the country

Environmental Benefits

Use of iron ore fines to make iron ore pellets and use them for sponge iron production will help in utilizing the natural resource for beneficial purpose.

Use of producer gas generated using coal gasifier in pellet induration is a clean fuel. Its use will save the use of polluting Fuel Oil.

Liquid effluents will be treated and reused / recycled within the plant premises. This will serve the purpose of water conservation.

Solid wastes will be utilized for various beneficial purposes like land filling and reclamation, as filler material in civil construction, and flyover making, raising embankments, filling of empty voids of the mines, brick/ block and tiles making, etc.

Social Benefits

Local people will get direct and indirect employment in the project, during the construction and operation phases.

There will be lot of indirect employment opportunity due to the project like vehicle drivers and conductors, workshop and mechanics, grocery and provision stores, chemist and other cottage services like barber, painter, electrician, carpenter, and many other trades, etc .

Financial Benefits

Investment of INR 1465 Crores will benefit the Indian economy.

Addition of revenue to Govt kitty by way of Income Tax and GST.

As per analysis, the overall financial, liquidity and profitability parameters of the project are considered reasonable, achievable and satisfactory. In view of the above the proposed Project of M/s Jai Balaji Jyoti Steels Limited is technically feasible and financially viable.