Pre-feasibility report

Prepared for

REAL ISPAT & POWER LTD.

For

Establishment of Integrated Steel plant consisting of I/O Beneficiation cum Pelletization Plant of 1.6 mtpa, DRI kilns of 2x650 TPD, 2x350 TPD & 2x100 TPD to produce 7,60,000 TPA of Sponge iron with 2x20 MW, 2x10 MW & 2x3 MW WHRB facility, Induction Furnaces of 5x30 T, 5 x 20 T to produce 7,50,000 TPA of M.S. Billets / M.S. Ingots / Hot Metal, Rolling Mill of 7,00,000 TPA of Rolled Products/ TMT Bars / Structural Steel & Producer Gas Plant of 80,000 Nm^3/hr capacity, Ferro Alloy unit of 2 x9 MVA to Produce Fe-Si (OR) Fe-Mn (OR) Si-Mn (OR) Pig Iron, CFBC Power Plant of 40 MW)

at

Khasra Nos. 2, 27/6, 27/4, 27/12, 27/13, 27/14 of Bakulahi Village and 379, 380/2, 381, 409/2, 409/3, 409/6, 409/7, 409/8, 417/1, 417/2, 417/3, 417/4, 417/5, 417/6, 417/7, 417/8, 417/9, 417/10 of Dhourabhata Village, Bhatapara Tehsil, Baloda Bazar District, Chhattisgarh

Submitted to MoEF&CC, New Delhi

(For Obtaining Environmental Clearance)

Chapter - 1
EXECUTIVE SUMMARY

1.1 ABOUT PROJECT PROPONENT & PROPOSED PROJECT

Real Ispat & Power Ltd. (RIPL) is proposed to establish an Integrated Steel plant in Khasra Nos. 2, 27/6, 27/4, 27/12, 27/13, 27/14 of Bakulahi Village and 379, 380/2, 381, 409/2, 409/3, 409/6, 409/7, 409/8, 417/1, 417/2, 417/3, 417/4, 417/5, 417/6, 417/7, 417/8, 417/9, 417/10 of Dhourabhata Village, Bhatapara Tehsil, Baloda Bazar District, Chhattisgarh. The following are the proposed units & production capacities:

S.No.	Proposed Units		Unit Configuration	Production Capacities
01	Iron Ore Beneficiation Plant		2.0 mtpa	2.0 mtpa
02	Pellet Plant		2 x 0.8 mtpa OR 1x1.6 mtpa	1.6 mtpa
03	Coal Gasifier+ PCI For Pellet Plant & Rolling Mill		10 x 8000 Nm^3/hr	80000 Nm^3/hr
04	Sponge Iron Plant		2x650 TPD + 2x350 TPD + 2x100 TPD	7,60,000 TPA
05	Power Plant	WHRB	66 MW	66 MW
		CFBC	40 MW	40 MW
06	Steel Melt Shop with CCM		5 x 30 T + 5 x 20 T + 2 CASTER	7,50,000 TPA
07	Ladle Refining Furnace (LRF)		2 x 25 T & 1 x 35 T	7,50,000 TPA
08	Rolling Mill with Standby Reheating Furnace 50 TPH		2 x 3.5 LTPA	7,00,000 TPA
09	Ferro Alloys Plant		2 x 9 MVA	2 x 9 MVA
	Silico Manganese (SiMn)			36,000 TPA
	(OR)			
	Ferro Manganese (FeMn)			66,000 TPA
	(OR)			
	Ferro Silicon (FeSi)			18,000 TPA
	(OR)			
	Pig Iron			72,000 TPA

- Project Description & Process details are presented in **Chapter-03** of the Report. The technology selected for all the plant facilities is modern and environment friendly.
- Total land earmarked for the proposed project is 156.909 Acres (63.52 Ha.). The total land is under possession of the Management.
- Estimated Capital Investment for the proposed project is Rs. 930.68 Crores.

- The water requirement for the proposed project will be **13255 KLD** (inclusive of domestic water) which will be met from Shivnath River. Water permission from Water Resource Department, govt. of Chhattisgarh is already obtained.

- Power required for the present proposal is estimated as approx. 136.2 MW, which will be partly met from 106 MW Captive Power Plant & remaining will be met from State Grid.

- The proposed project will generate direct employment 1000 nos. which will be employed officials, staff, skilled, semi -skilled labour & 1000 nos. indirectly employed in contract works & transport.

Chapter - 2

INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

2.1 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

RIPL is proposed to establish an Integrated Steel Plant in Khasra Nos. 2, 27/6, 27/4, 27/12, 27/13, 27/14 of Bakulahi Village and 379, 380/2, 381, 409/2, 409/3, 409/6, 409/7, 409/8, 417/1, 417/2, 417/3, 417/4, 417/5, 417/6, 417/7, 417/8, 417/9, 417/10 of Dhourabhata Village, Bhatapara Tehsil, Baloda Bazar District, Chhattisgarh.

Real Ispat & Power Ltd. is an integrated manufacturing firm and one of the fastest growing companies with a strong presence in the steel and power sector. The company's success story is backed by an extraordinary history. The growth of the company has always been ahead of the curve. A dream of creating a world-class company that pushes the boundaries of manufacturing technology through innovation, disruption and a unique management style was seeded a long time ago. The following are the Board of Directors of the company.

Mr. Umesh Agrawal : Director
Mr. Basant Agrawal : Director
Mr. Shiv Agrawal : Director
Mr. Ritesh Jindal : Director

RIPL entered the steel sector in the year 2000 and has slowly and steadily increased its contribution in the same ever since. The company has always believed in stabilizing and perfecting the existing set-up before moving on to the next step and it is this approach that has become our signature for success. RIPL caters to its clients through unparalleled quality, personalized service and development of a bond unmatched by any other. The multiple plants under the RIPL umbrella are all well versed with the latest technologies and are led by teams that cease to surprise in terms of commitment, dedication and creativity. These traits, which are valued quite highly and are a source for inspiration and motivation, are reflected in our products and services.

RIPL's true identity is imbedded in its contribution towards society. The company is well known for its CSR activities that span through every aspect of human life and the world we live in. We take immense pleasure in knowing that our efforts are helping build a greener environment, a developed society and a much more sustainable future.

2.2 BRIEF DESCRIPTION OF NATURE OF THE PROPOSED PROJECT

It is proposed to undertake establishment of Integrated Steel Plant with the following facilities.

Following additional facilities are proposed:

- I/O Beneficiation cum Pelletization Plant of 1.6 mtpa capacity
- 2x650 TPD, 2x350 TPD & 2x100 TPD of DRI kilns to produce 7,60,000 TPA of Sponge iron with 2x20 MW, 2x10 MW & 2x3 MW WHRB facility
- Induction Furnaces of 5x30 T, 5 x 20 T to produce 7,50,000 TPA of M.S. Billets / M.S. Ingots / Hot Metal &
- Rolling Mill of 7,00,000 TPA of Rolled Products/ TMT Bars / Structural Steel
- Producer Gas Plant + PCI of 10 x8,000 Nm^3/hr,
- Ferro Alloy unit of 2 x9 MVA to Produce Fe-Si, Fe-Mn, Si-Mn & Pig Iron,
- CFBC Power Plant of 40 MW capacity.

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY AND OR REGION.

GLOBAL SCENARIO

- In January-July 2019, the world crude steel production reached 1083.95 million tonnes (mt) and showed a growth of 4.6% over January-July 2018.
- China remained world's largest crude steel producer in same period (577.06 mt) followed by India (66.19 mt), Japan (59.47 mt) and the USA (51.83 mt).
- World Steel Association has projected Indian steel demand to grow by 7.1% in 2019 while globally, steel demand has been projected to grow by 1.3% in 2019. Chinese steel use is projected to show 1.0% growth in 2019.
- Per capita finished steel consumption in 2018 was 224.5 kg for world and 590.1 kg for China (Source: World Steel Association). The same for India was 73.3 kg in 2018 (Source: JPC).

DOMESTIC SCENARIO

- 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 2nd largest producer of crude steel during 2018, from its 3rd largest status in 2017. The country is also the largest

producer of Sponge Iron or DRI in the world and the 3rd largest finished steel consumer in the world after China & USA.

- 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 roadmap 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.

  Source: https://steel.gov.in

PRODUCTION

- Production Steel industry was de-licensed and de-controlled in 1991 & 1992 respectively.
- India is currently the 2nd largest producer of crude steel in the world.
- In 2018-19, production of total finished steel (alloy/stainless + non alloy) was 101.287 million tonnes (mt).
- Production of Pig Iron in 2018-19 was 6.414 mt, a growth of 11.9% over last year.
- India is the largest producer of Sponge Iron in the world. The coal based route accounted for 79% of total Sponge Iron production (34.71 mt) in the country in 2018-19.

2.3 DEMAND AND SUPPLY GAP

- Industry dynamics including demand – availability of iron and steel in the country are largely determined by market forces and gaps in demand-availability are met mostly through imports.

- Interface with consumers exists by way of meeting of the Steel Consumers' Council, which is conducted on regular basis.

- Interface helps in redressing availability problems, complaints related to quality.

2.4 EXPORT POSSIBILITY

Iron & steel are freely exportable. India emerged as a net exporter of total finished steel in 2016-17 and 2017-18 but is currently a net importer.

2.5 DOMESTIC/EXPORT MARKETS

While the demand for steel will continue to grow in traditional sectors such as infrastructure, construction, housing automotive, steel tubes and pipes, consumer durables, packaging, and ground transportation, specialized steel will be increasingly used in hi-tech engineering industries such as power generation, petrochemicals, fertilizers, etc. The new airports and railway metro projects will require a large amount of steel. Hence the domestic and export markets for steel sector will rise.

2.6 Employment Generation (Direct and Indirect) due to the project.

The local areas will be benefited by way of generation of employment opportunities, increased demand for local products and services. There will be an overall improvement in the income level of the local people.

The proposed project will generate direct employment 1000 nos. which will be employed officials, staff, skilled, semi -skilled labour & 1000 nos. indirectly employed in contract works & transport.

Top priority will be given to locals for Semi-Skilled and Unskilled jobs. With the development of this Plant there will be lot of scope for more ancillary development, which in turn will benefit the nation.

Sr.No.	Department	Manager	Supervisor	Skilled	Un-skilled	Total
1	I/O beneficiation plant	5	10	30	80	125
2	Pellet plant	10	20	50	80	160
3	DRI Plant	10	20	40	50	120
4	Captive Power Plant	10	20	40	50	120
5	Steel melt shop	6	10	50	80	146
6	Rolling mills	6	10	60	100	176
7	Coal Gasifier + PCI	3	5	5	10	23
8	Ferro Alloy unit	5	10	20	40	75
9	General Administration	10	5	20	20	55
	Total	**65**	**110**	**315**	**510**	**1000**

Chapter – 3
PROJECT DESCRIPTION

3.1 TYPE OF PROJECT INCLUDING INTERLINKED AND INTERDEPENDENT PROJECTS:

3.1.1. Type of Project:

Real Ispat & Power Ltd. has received Environmental Clearance earlier issued vide order No. J-11011 / 170 / 2009 – IA II (I) dated 25th March 2010 for the Integrated Steel Plant in the same location.

However the management could not implement the project due to delay in land acquisition and sluggish industrial scenario. Meanwhile the E.C. was expired on 25th March 2017.

Now 156.909 acres of land is in the possession of management.

Now the Management has revised Plant Configuration and applying as Fresh proposal.

Real Ispat & power Ltd. is envisage to produce the following product through different routes:

Unit	:	Description
Iron ore beneficiation	:	Manufacturing of Iron ore concentrate using Iron ore fines as raw materials
Pellet plant	:	Manufacturing of Pellet using Iron ore concentrate, Bentonite, Limestone as raw material.
Sponge Iron	:	Production of Sponge Iron from Iron Ore /Pellets, coal & Dolomite. The waste flue gases from the kiln will pass through WHRB and power will be generated.
Induction Furnace / Electric Arc Furnace	:	Manufacturing of MS and SS Ingots/ billets/ blooms using Sponge Iron, Scrap, Ferro Alloys as raw materials
Rolling Mill	:	Manufacturing of Rolled Product using MS Ingots / Steel Billets as raw materials.
Gasifier + PCI	:	Producer Gas + PCI generation utilizing Coal as raw material for supplying fuel for Pellet Plant & Rolling Mill.
Submerged Electric Arc Furnace	:	Manufacturing of Ferro Alloys using Manganese Ore, Quartz, Scrap, LAM coke, Electrode paste, etc. as raw materials.

Ministry of Environment, Forest & Climate Change (MoEF&CC) has made prior Environmental Clearance (EC) for certain developmental projects mandatory through its notification issued on 14th September 2006 and its subsequent amendments.

As per the EIA notification dated 14th September, 2006 & its subsequent amendments, all Primary metallurgical processing industries are listed under S.No. 3(a), under Category 'A'.

3.1.2. INTERLINKED PROJECT:

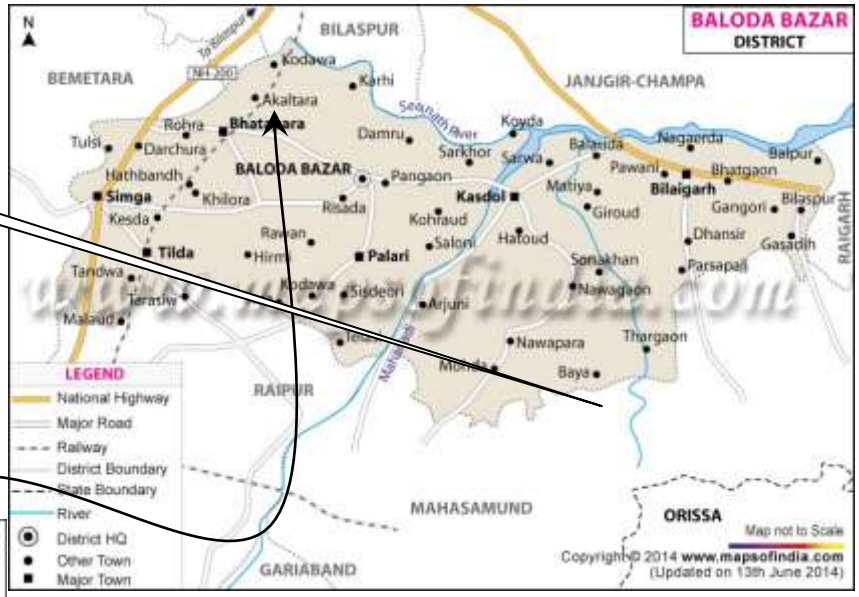
No interlinked project is envisaged.

3.2 GENERAL LOCATION:

The proposed new project site falls in the Survey of India Topo-Sheet No.64 K/1 and located (**Latitude - 21°48'07.30"N & Longitude - 82° 02'25.78"E)** at Sy. No. 2, 27/6, 27/4, 27/12, 27/13, 27/14 of Village, 379, 380/2, 381, 409/2, 409/3, 409/6, 409/7, 409/8, 417/1, 417/2, 417/3, 417/4, 417/5, 417/6, 417/7, 417/8, 417/9, 417/10 Dhourabhata Villages, hatapara Tehsil, Baloda Bazar District, Chhattisgarh.

The proposed project will be taken up in 156.909 Acres (63.525 Ha.) of land. Total land is in possession of management. General location map showing the plant location is shown below:

Project Site



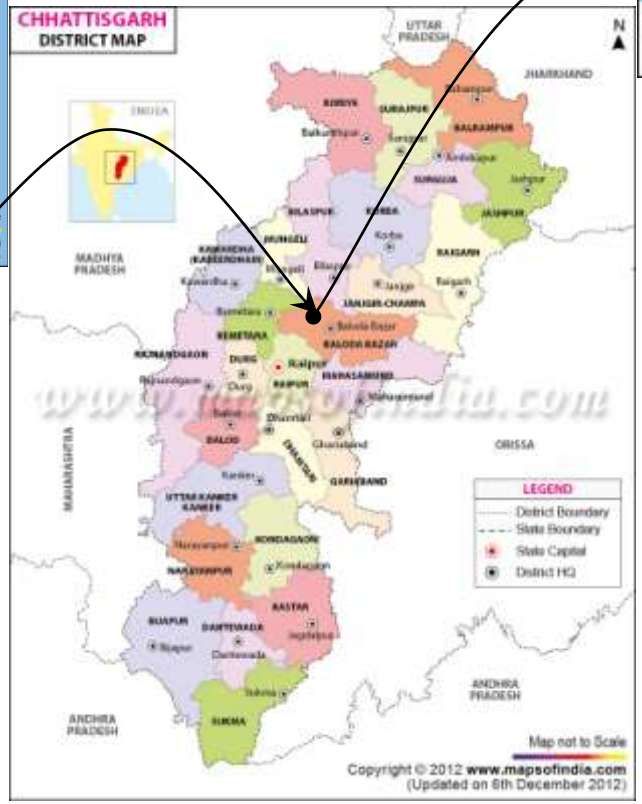
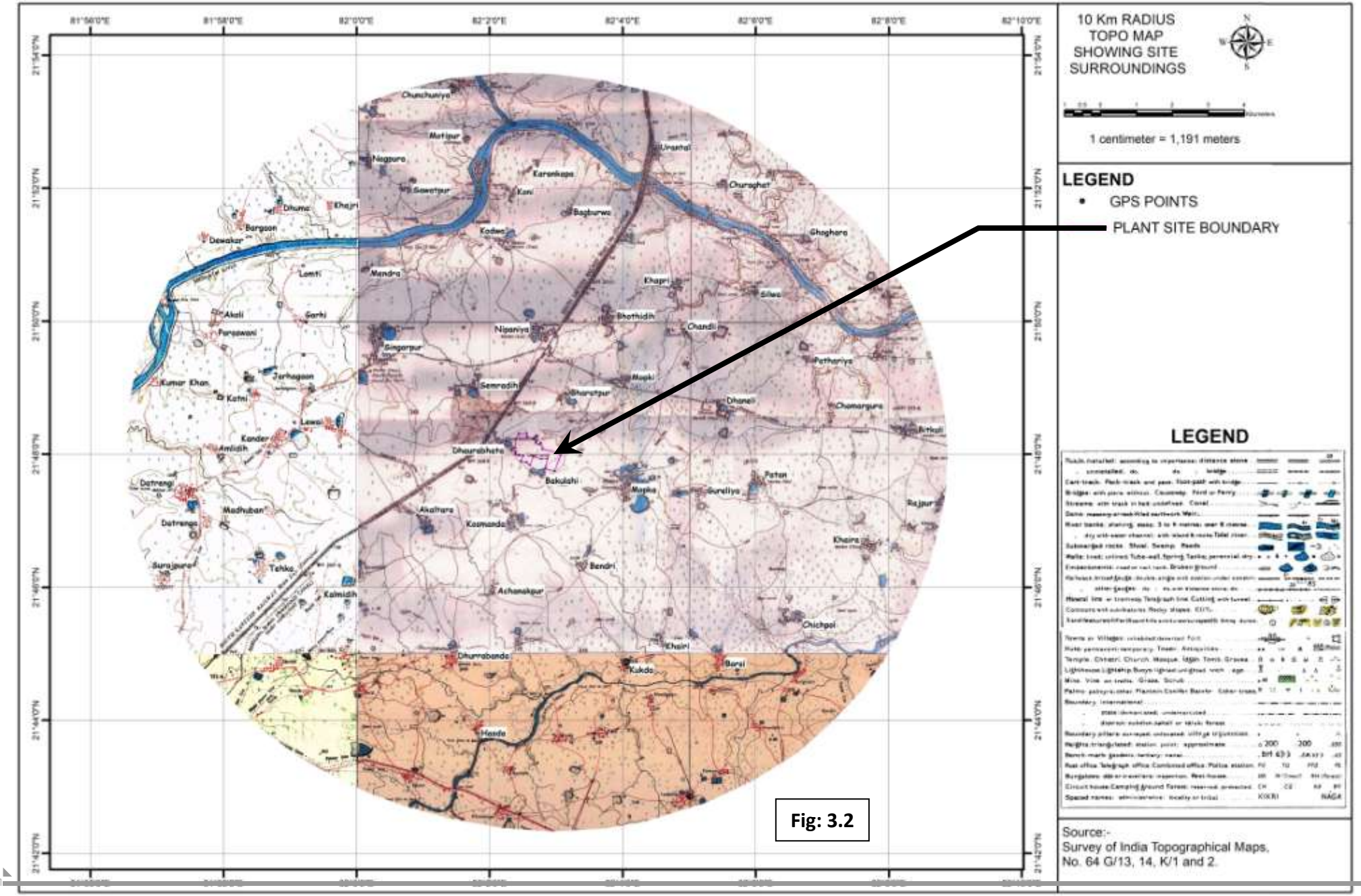


Fig: 3.1


10 Km RADIUS
TOPO MAP
SHOWING SITE
SURROUNDINGS
1 centimeter = 1,191 meters
LEGEND
GPS POINTS
PLANT SITE BOUNDARY
LEGEND
Source:-
Survey of India Topographical Maps,
No. 64 G/13, 14, K/1 and 2.
Chanchuriya
Matigur
Nagpura
Sawatpur
Karenkapa
Kavi
Bagburwa
Kadwa
Unasthal
Churaghat
Ghaghara
Dhuma
Khajri
Bargaon
Dewakar
Lamti
Mandra
Akali
Garhi
Parsawani
Singarpur
Nipaniya
Bhothidih
Khapri
Silwa
Chandi
Petheriya
Kumar Khan
Jarhagaon
Katni
Semradih
Bharatpur
Mapki
Dhanali
Chamargura
Lawa
Kander
Amlidih
Dhaurabhata
Bakulahi
Mapka
Guraliya
Patan
Datrenga
Madhuban
Akaltara
Kasmanda
Khaira
Bendri
Achanakpur
Kalmidih
Tehka
Chichpal
Khairi
Dhurrabandh
Kukda
Barsi
Hasda
Fig: 3.2

3.3 DETAILS OF ALTERNATE SITES CONSIDERED:

No alternative site has been considered; as Environmental Clearance was issued earlier vide order No. J-11011 / 170 / 2009 – IA II (I) dated 25th March 2010 for Integrated Steel Plant in the same location.

However the management could not implement the project due to delay in land acquisition and sluggish industrial scenario. Meanwhile the E.C. was expired on 25th March 2017.

Now 156.909 acres of land is in possession of the management.

Now the Management has revised the Plant Configuration and applying as Fresh proposal.

3.4 SIZE OR MAGNITUDE OF OPERATION:

The proposed plant configuration & production capacity of Integrated steel plant is given as below:

S.No.	Proposed Units		Unit Configuration	Production Capacities
01	Iron Ore Beneficiation Plant		2.0 mtpa	2.0 mtpa
02	Pellet Plant		2 x 0.8 mtpa OR 1x1.6 mtpa	1.6 mtpa
03	Coal Gasifier+ PCI For Pellet Plant & Rolling Mill		10 x 8000 Nm^3/hr	80000 Nm^3/hr
04	Sponge Iron Plant		2x650 TPD + 2x350 TPD + 2x100 TPD	7,60,000 TPA
05	Power Plant	WHRB	66 MW	66 MW
		CFBC	40 MW	40 MW
06	Steel Melt Shop with CCM		5 x 30 T + 5 x 20 T + 2 CASTER	7,50,000 TPA
07	Ladle Refining Furnace (LRF)		2 x 25 T & 1 x 35 T	7,50,000 TPA
08	Rolling Mill with Standby Reheating Furnace 50 TPH		2 x 3.5 LTPA	7,00,000 TPA
09	Ferro Alloys Plant		2 x 9 MVA	2 x 9 MVA
	Silico Manganese (SiMn)			36,000 TPA
	(OR)			
	Ferro Manganese (FeMn)			66,000 TPA
	(OR)			
	Ferro Silicon (FeSi)			18,000 TPA
	(OR)			
	Pig Iron			72,000 TPA

3.5 DESCRIPTION OF MANUFACTURING PROCESS

3.5.1 Process of Iron Ore Beneficiation

Beneficiation is a process, which removes the gangue particle like Alumina, Silica from the Iron Ore. Basically, it separates Fe_2O_3 or Fe_3O_4 from other impurities in the iron ore. In this process the Fe content is improve to maximum possible extent. The highest can be 70% i.e. purest form.

Process Description

Iron ore fines reclaimed from the blending stockpile shall be conveyed into a surge bin within the beneficiation plant building. Ore drawn from the surge bin by a belt weigh feeder is fed to a spiral screw type classifier.

Washed ore from spiral classifier is screened for +4 mm and -4 mm fractions over a scalping screen. Undersize fraction of -4 mm is pumped to sizing screens for screening off -1 mm fraction. Oversize fractions of +4 mm from the scalping screen and +1 mm from the sizing screens are ground in a primary ball mill in closed circuit with sizing screens to get 100% -1 mm solids suitable for gravity separation in spirals.

Washed sizing screen underflow fraction of -1 mm is pumped to dewatering cyclones. Underflow of dewatering cyclones is beneficiated by gravity separation through two stage spirals viz., rougher and cleaner spirals. Concentrate from spirals circuit is ground to a size consistency of 100% passing 100 mesh and ~70% passing 325 mesh in secondary ball mills in closed circuit with classifying cyclones. Ground concentrate from the classifying cyclones overflow as well as the overflow from dewatering cyclones ahead of spirals are pumped to concentrate thickener. Concentrate thickener underflow is thereafter filtered to get a product with 8% moisture max. The filter cake is conveyed to stockpile.

Tailings from the spirals circuit is pumped to a linear screen to ensure a 100% -1 mm size solids in the slurry being fed to high gradient magnetic separators to recover feebly magnetic Fe units. Concentrate from high gradient magnetic separators is diverted to secondary ball mill discharge pump box for grinding along with spiral concentrate, to desired fineness.

Tailings from high gradient magnetic separators is fed to tailings thickener.

Spiral classifier overflow is pumped to de-sliming cyclones. Overflow from these de-sliming cyclones is fed to the tailings thickener. Underflow from de-sliming cyclones is diverted to spiral tailings pump box in turn to high gradient magnetic separators to recover Fe units as much as possible.

Tailings thickener underflow is pumped to tailings settling pond. Clear water from concentrate thickener, tailings thickener and tailings settling pond flows by gravity back into the process water sump for recirculation. Process flow diagram showing Beneficiation of Iron Ore is shown as Fig. 3.3.

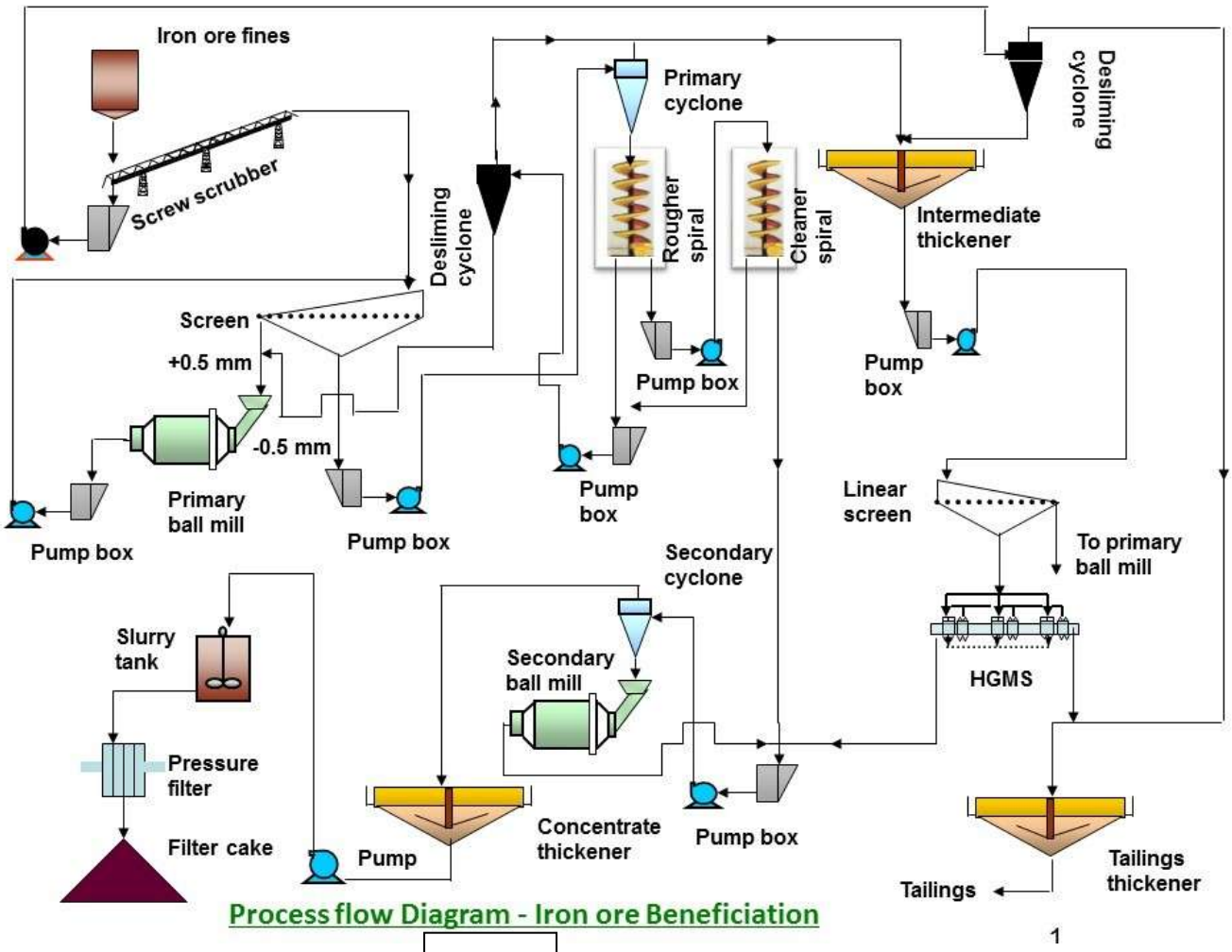


Fig: 3.3

3.5.2 Process of Iron Ore Pelletisation

The process of pelletization enables converting Iron Ore Fines into "Uniformed Sized Iron Ore Pellets" that can be charged into the blast furnaces or for Production of Direct Reduced Iron (DRI). Pellets are uniform size, with purity of 63%- 65% contributing to faster reduction and high metallization rates.Pellets with their high, uniform mechanical

strength and high abrasive strength increase production of sponge iron by 25% to 30% with same amount of fuel.

The iron ore pelletization unit comprises of following sections:

a) Drying & Prepn. of Iron Ore Fines
b) Grinding
c) Mixing and Blending
d) Pelletization
e) Screening
f) Travel Grate Furnace
g) Rotary Kiln
h) Cooler
i) Stacking
j) Recovery of Dust and Spillage

a. Drying & Preparation of Iron ore Fines:

Generally Iron Ore Fines, Lime Stone and Dolomite fines available, contain more than 6-7% moisture and require drying before grinding. The drying is carried out in Rotary Drum Dryer. The moisture content in the dry material is controlled. The low grade Iron Ore Fines is feed in a screen for separation. Oversize/ under size moves to the primary grinding circuit.

b. Grinding

Iron Ore Fines, Dolomite and Lime Stone are mixed in required proportion and fed into a Ball Mill. The fineness of the product is controlled as may be necessary for particular ore and Pellet quality.

c. Mixing and Blending

Iron Ore powder blended with Bentonite and other binding materials in desired proportion. Small quantity of water is added during blending operation. This raw mix is ready for Pellet making and store in feed hopper.

d. Pelletization

Controlled quantity of raw mix is fed on disc Pelletizer. Some amount of water is sprinkled for producing Pellets. These Pellets are passed through oversize and undersize screens. Sized Pellets are then sent to sintering section.

e. Screening

Pellets produce in Pelletization sections are passed through oversize and undersize screens. Rejects Pellets are sent back to raw mix silos sized Pellets are fed in to Indurations Furnace.

f. Travel Grate Furnace

A Travel Grate Furnace is used for indurations of Pellets. This is divided into 3 sections (Drying–Preheating–Heating). Hot Pellets at around 950ºC to 1000ºC from this Travel Grate are dropped into the Kiln for further strengthening.

g. Rotary Kiln

Rotary Kiln receives Pellets from the Indurations Furnace where Pellets have to withstand at high temperature approx. 1050ºC – 1200ºC. Here the Pellets gain more hardness due to high temperature. Furnace Oil / Producer Gas is used as a fuel inside the Kiln. After the Kiln the Pellets are passed to the Grate Cooler.

h. Cooler

Grate Cooler receives hot Pellet with temperature up to 1200ºC coming from Rotary Kiln. Cooler has its own blowers to blast the air from bottom. The hot air from the first zone is used as a combustion air in kiln. The hot blast of the second zone is used in the pre-heating zone-1 of travel grate and the air from the 3rd zone is discharged to the atmosphere through chimney as its dust concentration is well within the permissible limits of pollution norms. Volume of cooling air in all the three zones is regulated automatically through the temperature control loops as per the requirement. Cold Pellets at about 100ºC are discharged on conveyors and they are quenched by the cold water for further cooling and then conveyed to the stock pile/ loading hoppers.

i. Stacking

The screened Pellets of required size duly cooled at air cooler and subsequently natural cooling are transported to Bunkers.

j. Recovery of Dust and Spillage

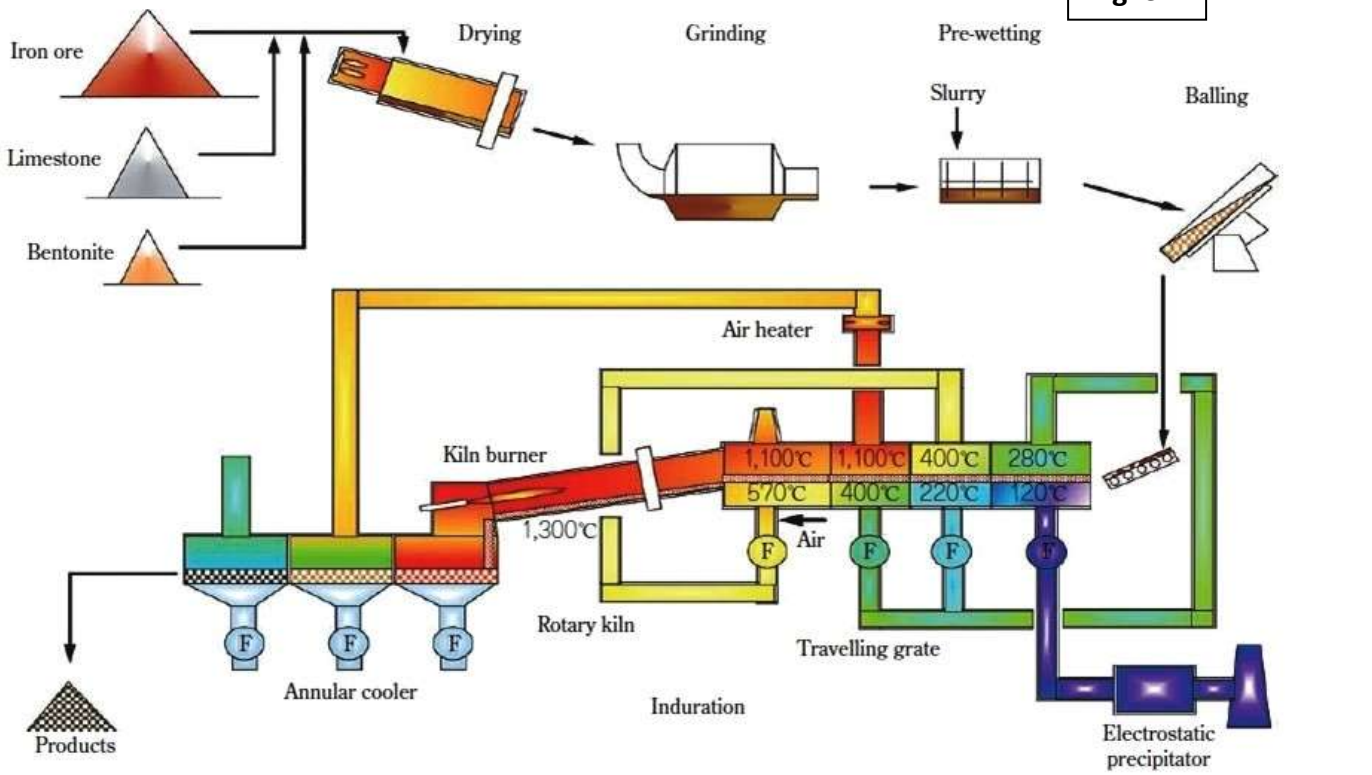
Spillage from drying zone and preheating zone of traveling grate, dust from the wind box of traveling grate and dust collected through de-duster of technological process shall meet and will be sent to dust bin via belt conveyor, after they are ground

together with iron ore concentrate at grinding mill. Spillage (dry Pellets) produced at the discharge end of traveling grate will be fed into the kiln from the feed chute of the kiln feed end by bucket elevation. Almost all the dust and spillage are re-circulated and recovered.

Process flow diagram of manufacturing process of Pellets is shown as Fig.3.4.

Process Flow Diagram - Pellet Plant

Fig: 3.4



3.5.3 Process of Sponge Iron Manufacturing

It is a coal based plant for converting Iron Ore to Iron through direct reduction. The Oxide Ore Fe_2O_3 (Hematite) is reduced to 'Fe' by using Carbon at 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 AC motor and girth gear mechanism. Refractory lined rotary kiln of suitable size is placed on two or 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 are 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 30 mm DRI. The undersize - a mix of DRI, dolo-char and coal ash are screened into +/- 3 mm fractions. Each fraction passes through a magnetic separator. The non-magnetic portion of the plus 3 mm fraction is mostly char and can be recycled to the kiln if desired.

- The nonmagnetic portion of -3mm fraction, mostly spent lime, ash and fine char is discarded.

- Magnetic portion of each fraction is DRI. Of this the +3mm fraction can be used directly for steel making and the finer fraction is either briquetted or collected in bags.

- 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.

- Burnt gases are passed through a down duct into an evaporation cooler where its temperature is brought down 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.

- The thermal energy in outgoing flue gases is recovered through Waste Heat

Recovery Boiler (WHRB) where sensible heat of the gases is extracted and then let off into the atmosphere after passing through pollution control equipment like ESP, ID fan and stack.

Power Generation through Waste Heat Recovery from proposed Dri Kilns

The hot gases from DRI kilns will be taken to WHRBs and after heat recovery it will be used for Power Generation. A total of 66 MW will be generated through flue gases from DRI.

Now it is proposed to install

2x80 TPH of Waste Heat Recovery Boiler to generate 2x20 MW of Power from the hot flue gases produced from 2 x 650 TPD capacity DRI Rotary Kilns.

2x40 TPH of Waste Heat Recovery Boiler to generate 2x10 MW of Power from the hot flue gases produced from 2 x 350 TPD capacity DRI Rotary Kilns.

2x12 TPH of Waste Heat Recovery Boiler to generate 2x3 MW of Power from the hot flue gases produced from 2 x 100 TPD capacity DRI Rotary Kilns.

Process flow of Sponge Iron manufacturing is shown as Figure 3.5.

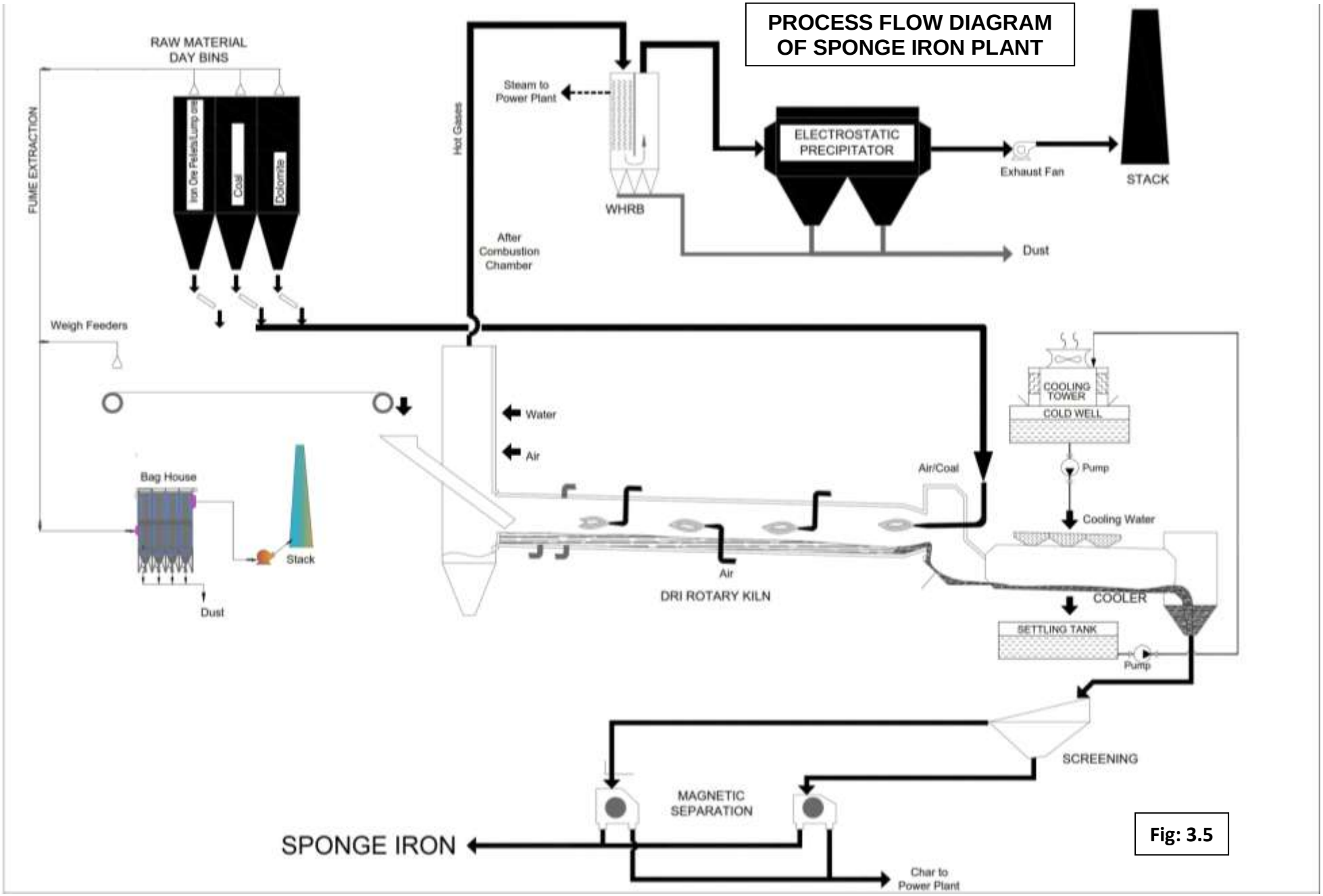

PROCESS FLOW DIAGRAM OF SPONGE IRON PLANT
RAW MATERIAL DAY BINS
FUME EXTRACTION
Iron Ore Pellets/Lump ore
Coal
Dolomite
Steam to Power Plant
Hot Gases
WHRB
ELECTROSTATIC PRECIPITATOR
Exhaust Fan
STACK
After Combustion Chamber
Dust
Weigh Feeders
Water
Air
Air/Coal
COOLING TOWER
COLD WELL
Pump
Cooling Water
Bag House
Stack
Dust
Air
DRI ROTARY KILN
COOLER
SETTLING TANK
Pump
SCREENING
MAGNETIC SEPARATION
SPONGE IRON
Char to Power Plant

Fig: 3.5

3.5.4 Process Description of Steel making in Steel Melt Shop

Electric 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 the Hot Strip Rolling Mill.

Provision shall be made in the Caster to produce billets also in case of market demand. The proposed process is well established for the last four decades and is most environment friendly and energy efficient. The Slabs from the Caster shall be hot charged to the Rolling Mill Reheating Furnace to reduce fuel consumption.

i) IF Melting

a. The Charge-Mix shall comprise « 44% Sponge Iron, 50% Scrap & 6% Pig Iron.
b. The material shall be charged to the IF through a Vibro Feeder at desired rate matching the melting rate in crucible.
c. The Scrap is melted first to create a molten bath. Sponge Iron is then charged continuously through Vibro-Feeder. Slag formed is removed periodically.
d. After the 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 or petroleum coke for achieving the necessary carbon content in the bath.
e. 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.

Advantages of IF melting are:

- Better yield of liquid steel from charge as no oxygen is used.
- Better homogenization of temperature and composition due to stirring effect of eddy currents.
- Less fume generation.
- Low operating cost as expensive graphite electrodes are not used.

ii) Ladle Furnace

a. The Molten Steel Ladle shall be transferred to a Ladle Car for carrying out secondary refining in the Ladle Furnace.

b. The Ladle has a porous refractory plug at the bottom to purge Argon gas to keep the molten metal in vertical stirring movement.

c. 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.

d. Lime is used as flux for refining the steel.

e. 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.

Fumes generated during the process are sucked through a collection hood is IF are sucked through a cyclone-cum-spark arrestor and LF fumes sucked through its roof outlet enter 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. Dust content at Stack outlet will not exceed 30 mg/Nm^3.

iii) Slab Caster

Liquid Steel Ladle after Ladle Furnace secondary refining is 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 Slab Caster shall have two (2) Strands with 9/18 m radius. Provision is kept for casting of square billets range from 100x100mm to 160 x 160mm 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.

Process Flow for Steel Making is shown in figure 3.6.

PROCESS FLOW DIAGRAM FOR MANUFACTURING HOT METAL / M.S.INGOTS / M.S. BILLETS

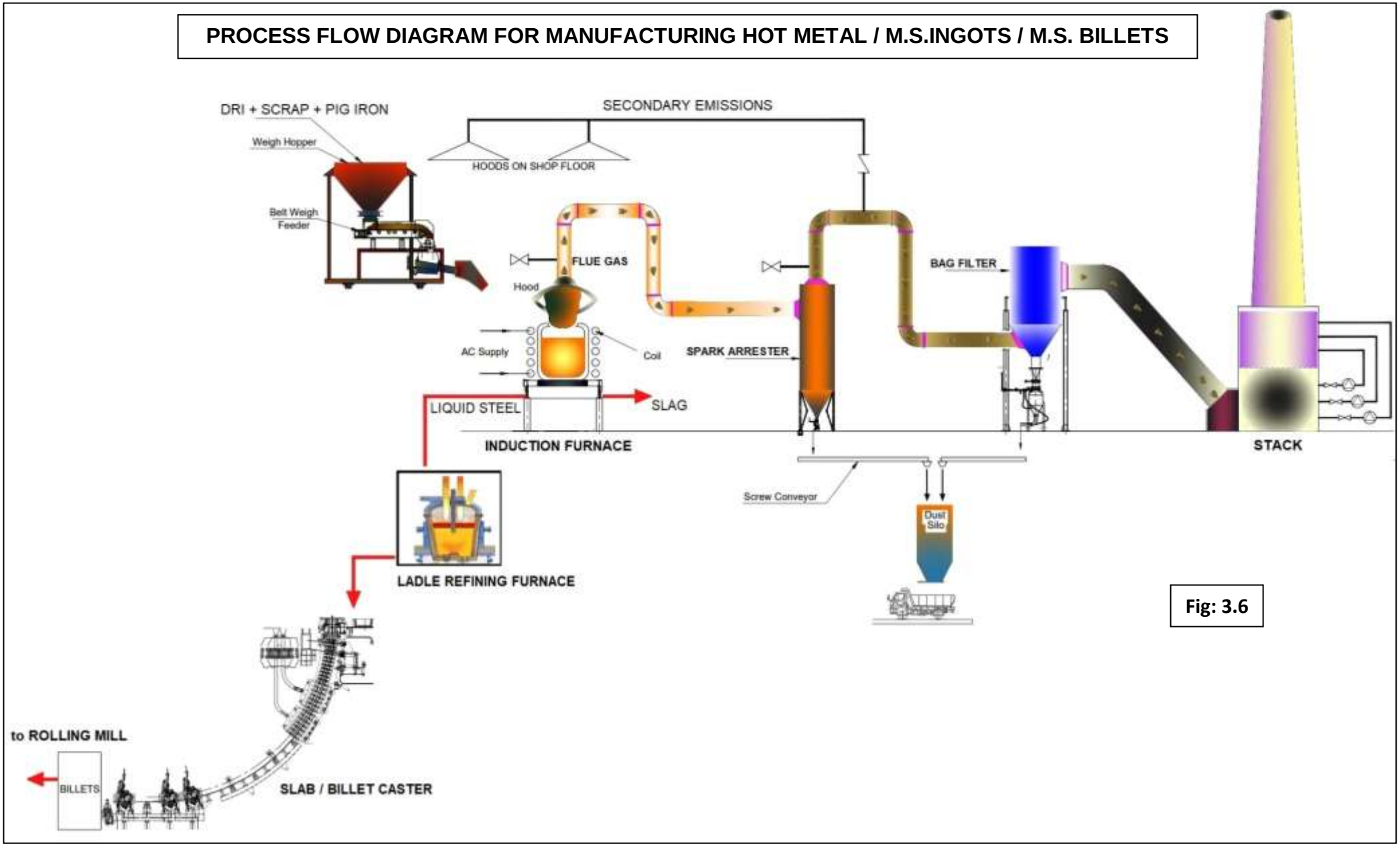


Fig: 3.6

3.5.5 Manufacturing of Rolled Products through Rolling Mill

A pusher type furnace has been envisaged for the heating of Ingots/Billets. The furnace will be end charging and side discharging. It will have single row as well as double row charging facility. The furnace will be heated with FO/Producer Gas. The furnace combustion system will comprise of air blowers, FO storage, supply and preheating system and other associated facilities. The product of combustion will leave the furnace at charging end and exhausted through underground flue tunnel and passed through a metallic tubular recuperator before finally let off to a self-supporting steel chimney of sufficient height. A set of instrument will be used for smooth operation of the furnace.

Bar and Round mill

A cross country type mill has been envisaged for the plant. The stands have been grouped into roughing, intermediate and finishing groups. Roughing group will have 4 (four) stands, intermediate group will have 8 (eight) stands and finishing mill will have 8 (eight) stands. Roughing group of stands will be driven by one motor. 4 nos. of intermediate stands will be driven by two motors and balance 4 nos. will be driven by a separate motor. Each stand of finishing group will be driven by single motor. Necessary guides and troughs will be provided at entry and exit of mill stands.

One wire rod outlet has been provided in the mill. The wire rod line will have 4 stand blocks driven by a single motor through gear box. Coil forming and handling of coil is provided.

Automated tilting, drop type tilter and feeding arrangement will be provided in roughing group of stands. Repeaters have been provided in roughing / intermediate stands as necessary.

Design provision has been made for introduction of slit rolling facility in future to roll 8 mm, 10 mm & 12 mm rebars in two strands. The rebars discharged from the mill will pass through a water cooling system comprising cooling pipes with high pressure water nozzles for rapid water quenching. At the cooling pipes the bar skin temperature will be reduced to about 600^{o}C. The core of the bar still remains hot. This entrapped heat tempers the bar. This thermo-mechanical treatment of the bars increases tensile

strength without adversely effecting weldability and elongation properties. This process eliminates requirement of cold twisting of bars for production of rebars.

A dividing shear, to cut the products to cooling bed length, will be located immediately after the water cooling system. This shear will divide all products to cooling bed lengths. Rake type cooling beds have been envisaged to receive the rolled product. Cooling bed will be provided with incoming and outgoing roller tables. One cold shear has been provided to cut the bars coming out of cooling bed into commercial length of 6 to 12 m. The bar products will be formed into bundles and will be strapped by strapping machine manually.

The finished products will be removed by overhead EOT crane and stored in the storage area or dispatched through road vehicles.

3.5.6 Ferro Alloys Manufacturing through Submerged Electric Arc Furnace

THE PROCESS:

Ferro Alloys will be smelted at about 1350 – 1500 deg.C Temperature. This will be achieved by a conventional, Open Submerged Electric Arc Furnace. The three carbon Electrodes, partially submerged in the charge, are supported on hydraulic cylinders for upward and down ward movements to maintain the desired electrical conditions.

The body of the furnace is cylindrical in shape, and is lined with firebricks, silicon carbide bricks and carbon tamping paste. Three tap – holes are provided at 120 degree apart for drawing out both the molten alloy and Slag. During the repair works one of the tap – holes the other will function as stand by.

The weighed raw materials will be thoroughly mixed in the proper proportion before charging into the furnace, through Skip, Telfer hoist and charging chutes. The charge will be pushed near to electrodes on Furnace top by a Charging Stoker

As the charge enters the smelting zone, the alloy formed by chemical reactions of the oxides and the reductants, will be heavy, and gradually settles at the bottom. At regular intervals the furnace will be tapped. The tap hole will be opened by Oxygen lacing pipe and after tapping is completed, it will be closed by clay plugs.

The liquid alloy and Slag will be collected in a Ladle and Slag will be over flowed to sand beds. The metal being retained in the ladle having a Nozzle at bottom which allows metal flows on to C.I. Pans. After solidification the cakes will be broken manually to required lump size.

SILICO MANGANESE & FERRO MANGANESE PROCESS:

Manganese ore is in the form of MnO, SiO_2, FeO, Al_2O3, MgO and other Oxides. MnO is reduced to Mn and FeO is reduced to Fe taking Carbon from Coke / Coal and the product is produced as Si Mn /Fe Mn. The other oxides are simultaneously removed as Slag along with metal. The Slag and Metal are separated by virtue of its self-differential gravities after collecting in the ladle. The ladle will have a nozzle in the bottom portion through which the metal flows in to C.I. Pans.

Chemical Composition of Si Mn

Sl. No.	Constituent	Percentage
1.	Mn	60 – 65%
2.	Si	+ 15%
3.	C	2% / 0.1% / 0.5%
4.	S & P	0.03% Max

Chemical Composition of Fe Mn

Sl. No.	Constituent	Percentage
1	Mn	70 – 85%
2	Si	+ 1.5%
3	C	7 - 8% / 1.5% / 0.5%
4	S	0.05%
5	P	0.04%

FERRO SILICON PROCESS:

Ferro Silicon is a Slag less process. Quartz is the main raw material which contains 99% of SiO_2. Charcoal and a small percentage of Coal is used as reductants. Mill Scale / Iron Ore is added to obtain Ferro Silicon. Fe O is reduced to Fe and Si O2 is reduced to Si Combining with Carbon and produced as Fe Si.

Sl. No.	Constituent	Percentage
1	Si	70 – 75%
2	C	7 - 8%
3	S	0.05%
4	P	0.4%

The way of dosing and charging of raw material:

Controlled raw material feeding through chutes and dozing by forklifts.

Power consumption details:

Power requirement for each product:

- For manufacturing FeSi : 8000Kwh/ton
- For manufacturing FeMn : 3000 Kwh/ton
- For manufacturing SiMn : 4000 Kwh/ton

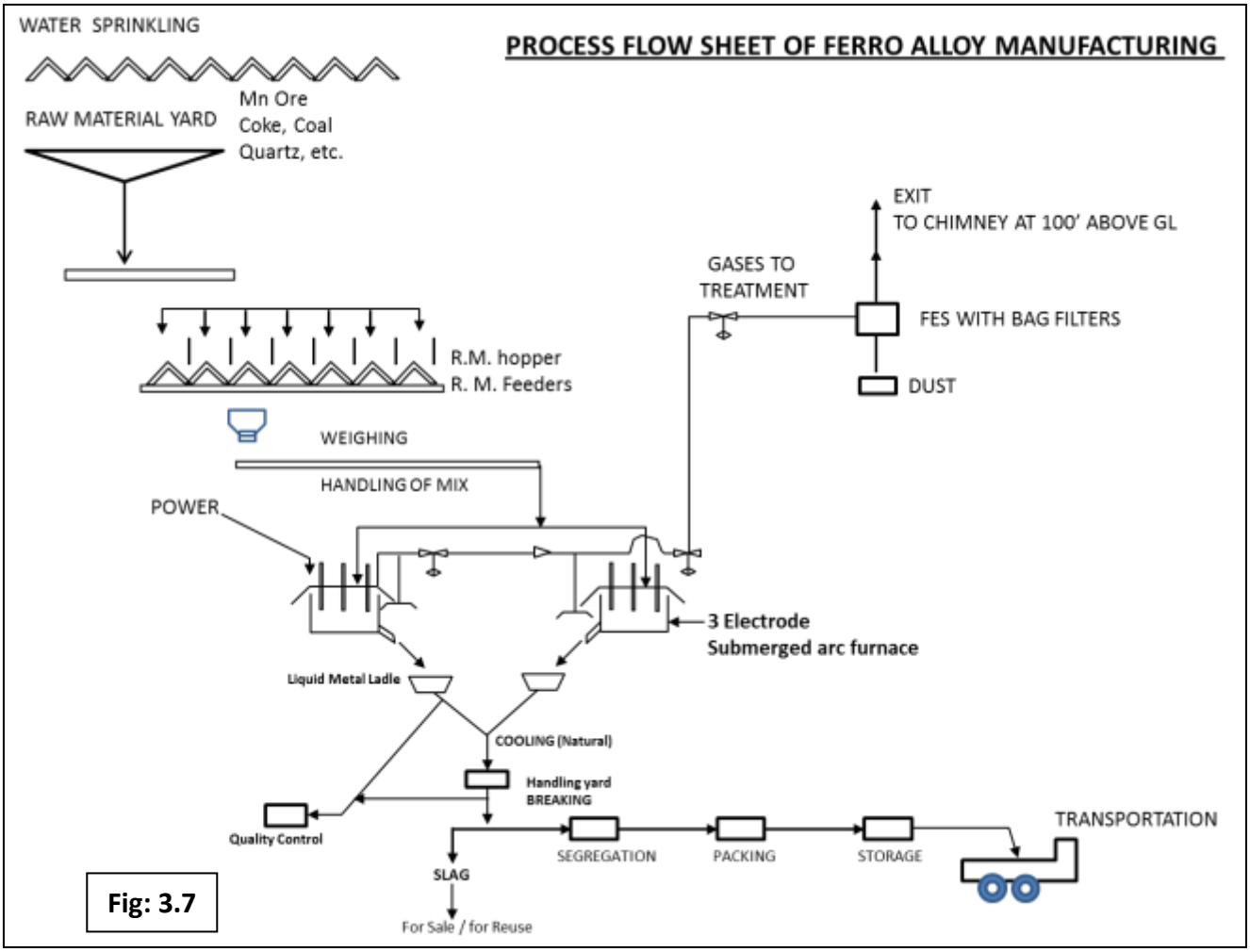


Fig: 3.7

PIG IRON PROCESS THROUGH SEAF

Pig Iron will be produced in SEAF using HG Iron Ore, Limestone & Coke as Raw Materials. Once pig iron is produced, it is teemed or poured into Induction Furnace either to produce an ingot or into a continuous caster to produce a slab, billet or bloom.

3.5.7 Circulated Fluidized Bed Combustion (CFBC) based Power Plant

Fluidized bed combustion is a "Clean Technology for a better tomorrow" where technology and economy have been interwoven harmoniously in quest of a better environment. The proposed CFBC boiler will be designed to deliver steam at 160 tph; 110 ata; 540°C with a feed water temperature of 210°C.

160 TPH of steam CFBC boiler will be provided to generate 40 MW of Power.

The environmentally friendly perspective of this technology is as follows:

- The modern CFBC boilers can capture Sulphur dioxide upto 95% by addition of limestone in the furnace.
- The concentration of SOx will be in the order of 1500mg/Nm³ @ 6% O_2. The concentration of SOx after lime addition will be 100mg/Nm³ @ 6% O_2.
- The Sulphur capture efficiency required will be 93.3%
- The CFBC combustor will be designed with a Sulphur capture efficiency of >95%.
- The leading boiler makers like ISGEC John Thomson, Thyssen Krupp and Thermax are supplying CFBC boilers with a guarantee of SOx less than 100mg/Nm³ @ 6% O_2.
- The furnace temperature in the CFBC combustor is maintained below 875°C by maintaining the solid circulation rate. Hence, the NOx concentration will be <100mg/Nm³ @ 6% O_2.
- The leading boiler makers like ISGEC John Thomson, Thyssen Krupp and Thermax are supplying CFBC boilers with a guarantee of NOx less than 100mg/Nm³ @ 6% O_2

POWER GENERATION PROCESS

The Steam Generator would be semi-outdoor type, natural circulation, and balanced draft, Single drum, designed for firing different grades of coal & Combned fuel such as Coal with Dolochar. The Boiler is of bubbling fluidised bed type to handle even high ash

coal. Capacity of FBC coupled with adjacent WHRB has been selected to ensure adequate margin over the requirement of turbine at 100% MCR. FBC would be designed to operate with "The HP heaters out of service" condition (resulting in lower feed water temperature at Economizer inlet) and deliver Steam to meet the Turbo-Generator requirement at 100% MCR. Economizer section of the Boiler would be non-Steaming type. Super heater sections would be convection type and designed so as to maintain rated Steam temperature of 540°C (:i: 5°C) at super heater outlet over the control range of 60% to 100%, MCR. Attemperator is provided at the outlet of convection super heater for temperature control at Steam Generator outlet. The Boiler furnace and flue gas passages would be designed for appropriate low velocities in order to minimize erosion. Suitable balanced draft System would be provided for the Steam Generator with one forced draft and one induced draft fans. Each of these fans would be capable of meeting the air requirement at 100% Boiler MCR load. The forced draft fans would be radial type with inlet vane control for regulation of airflow. The induced draft fans would be radial type with multi louver damper control the regulation. The forced draft fans would control total air flow to Boiler and the induced draft fan would control furnace draft of the Boiler through automatic control loops. In addition to the FD fan, one primary air fan of 100% capacity shall be provided for transportation of fuel. The Boiler would be top supported type and would be provided with all supporting Steel platforms, galleries and stairways for easy approach and Maintenance of the Unit. Adequate weather protection would be provided for instruments and operating personnel. Necessary insulation along with skin casing to limit outside surface temperature to the safe level would be provided.

Steam Turbine Generators and Auxiliaries

Steam Turbine

The Steam Turbine will be of condensing type. The set will be complete with Condenser, Air Evacuation System, 100% Condensate Extraction Pumps, Generator Cooling, System, Gland Sealing with Gland Vent Condenser, Lube Oil System, LP & HP Re-generative Feed Heaters, etc.

Excitation System

The Excitation System envisaged will be brush-less type. The Excitation System shall be capable of Supplying the Excitation Current of the Generator under all condition of Operation of Load, Voltage and Power. Rated current and Voltage of the Exciter shall be

at least 120% of normal Excitation Current and at least 110% of no Load Excitation Voltage with maximum of 140% ceiling. The Exciter response ratio shall be greater than 1.5. The Field Breaker and Field Suppression System will also be part of Exciter System. Automatic high speed Thyristorised, Auto Manual AVR capable of maintaining Steady State Terminal Voltage within :I: 0.5% of the present Value under all Operating Conditions and capable of smooth and continuous running over the Operating Range. The Generators shall be provided with Temperature Detector embedded at different location, i.e. Stampings, Stator Windings, etc.

40 MW power will be generated through FBC Boiler. The steam generated from both the WHRB and FBC boilers will drive the steam turbine through a common steam header. The flue gases will pass over various heat transfer surfaces to ESP and then finally discharged into chimney by ID fan. The flue gases will be treated in a high efficiency ESP to bring down the particulate matter in the gases to less than **30 mg/Nm^3** and discharged through a stack of adequate height.

Process flow diagram of CFBC based Power Plant is shown as Fig:3.8.

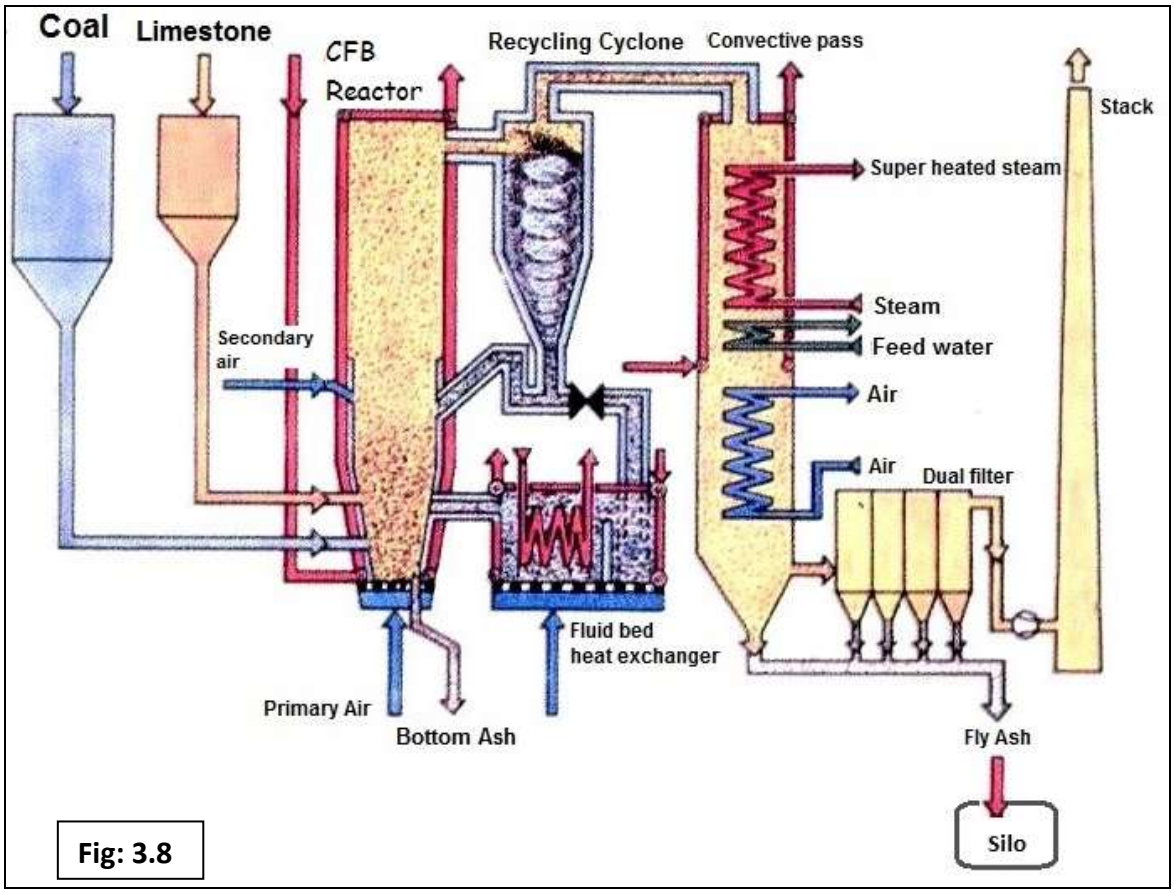


Fig: 3.8

3.5.7 PRODUCER GAS GENERATION THROUGH GASIFIER

Producer gas plant is proposed to be established for supply fuel to Pelletization Plant & Rolling Mill units. Coal is lifted to the coal storage bin by lifting system; the coal is added in the carbonation stage of two-stage coal gasifier by a programmable control feeding system. Air is blown in the bottom of furnace by air blower, at the same time, low pressure steam goes through the blending bin and blends with air, becomes the gasification agent, which will carry on the gasification reaction with 1200 Celsius degree semi coke in the gasification stage.

Producer gas is made by the gasification agent, which is mixture of steam and air, which goes through red-hot fixed burning bed. The oxygen content in the air and steam react with the carbon in the fuel; generating the producer gas which has ingredients like CO, CO_2, H_2, CH_4, C_2H_4, N_2 etc.

Reaction of steam and carbon is endothermic reaction:

$C + H_2O = CO + H_2$

When oxygen and carbon react, and then heat output:

$2C + O_2 = 2CO$

$C + O_2 = CO_2$

Some steam here reacts with carbon monoxide:

$CO + H_2O = CO_2 + H_2$

In the reducing zone, quick reaction is occurred when the temperature is below 1200 Celsius degree

$CO_2 + C = 2CO$ and

$H_2O + C = H_2 + CO$

When the coal gas goes through the reducing zone, flammable gas content raises rapidly, carbon dioxide and steam content decrease. Across the reducing zone, a part of coal gas is withdrawn through a series of vents in the gasifier walls and is called “DOWN STAGE GAS”. Its temperature is around 300-400 Celsius degree and contain dust and ash particles.

This down stage gas is treated in the cyclone to remove the dust particles, and is then cooled through a heat exchanger. In this heat exchanger the heat is given to the water in the steam drum. The gas is further cooled in a wind cooler, where natural air cools the gas to a lower temperature. The thickness of the slag should be kept 200-400 mm and

when the layer thickness increases the de-slagging of the slag should be carried out with the help of stroker.

In the carbonation stage, the coal added in the gasifier are dried, preheated and carbonated, generate steam, tar and coal gas, exported from the top of gasifier together, this part of gas is called “up-stage coal gas”, its temperature is around 100-120 Celsius degree.

The Upstage and downstage coal gas are mixed in the entrance of indirect cooler, the temperature after mixing and cooling in the indirect cooler is 35-40 Celsius degree. The coal gas pressure adder increases the pressure of the coal gas to the desired value and then connects to the transmitting coal gas pipelines, which take the gas to the equipment. **Process flow chart is given as Fig: 2.5.**

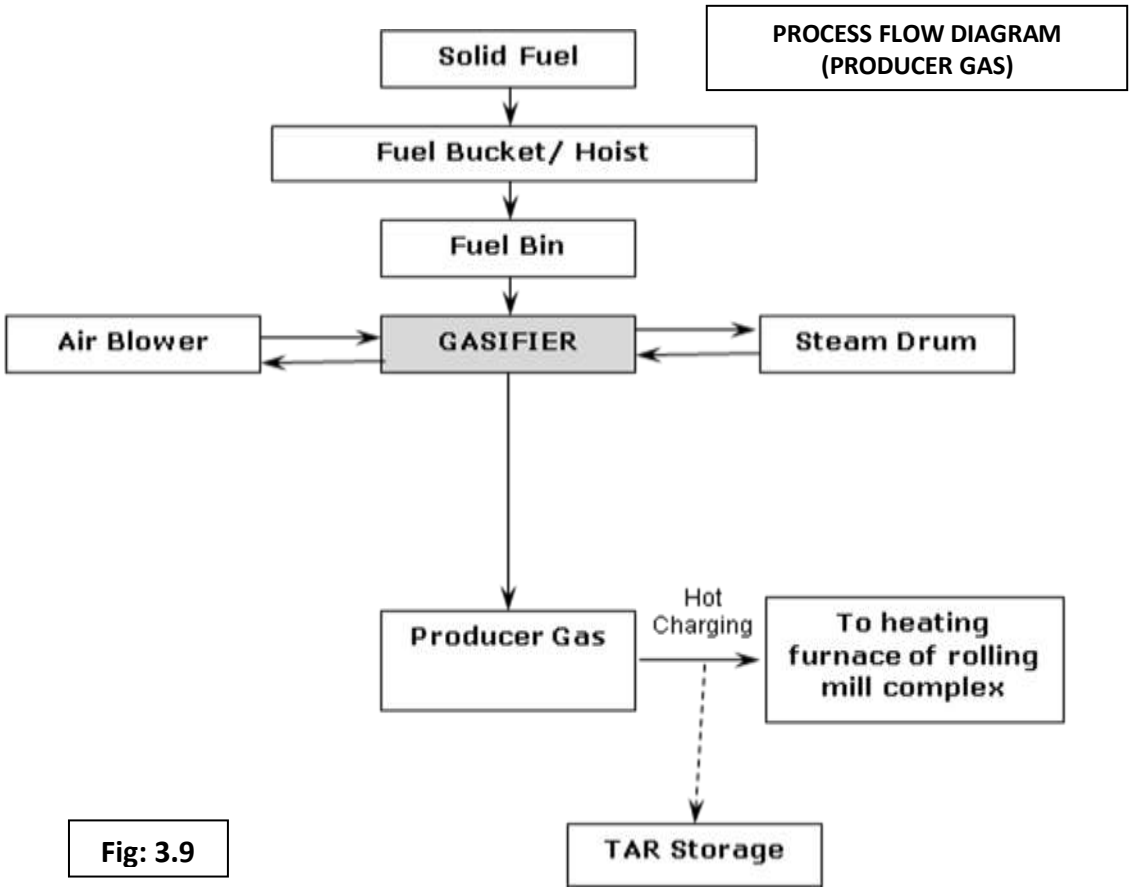


Fig: 3.9

3.6 RAW MATERIAL REQUIREMENT, TRANSPORT ETC.:

3.6.1 Raw Material Requirement and its sources

S.No.	RAW MATERIAL		QUANTITY (TPA)	SOURCES	MODE OF TRANSPORT
1. For Iron Ore beneficiation plant (Iron ore concentrate) – 2.0 mtpa					
a)	Iron ore fines		20,00,000	Chhattisgarh/ Orissa	By Rail & Road through covered trucks
2. For manufacturing Pellets - 1.6 mtpa					
a)	Iron ore Concentrate		16,00,000	In-House	Covered Conveyor
b)	Bentonite		21,000	Gujarat	By Rail & Road through covered trucks
c)	Lime Powder		22,500	Chhattisgarh/ MP	By Rail & Road through covered trucks
d)	Coke breeze		54,000	Indonesia / South Africa / Australia	By Sea, Rail & Road (Covered trucks)
e)	Coal (Gasifier) 40,000 NM^3) + PCI	Indian	1,26,000	SECL/ Orissa	By Rail & Road through covered trucks
		Imported	80,600	Indonesia / South Africa / Australia	By Sea, Rail & Road (Covered trucks)
	Furnace Oil		40300 KL	Local	By Road through tanker
3. For manufacturing Sponge Iron of 7,60,000 TPA					
a.	Iron Ore Pellets		11,40,000	In-house	Covered Conveyor
b.	Dolomite		38,000	Chhattisgarh	By Road through covered trucks
c.	Coal	Indian Coal	9,88,000	SECL/ Orissa	By Rail & Road through covered trucks
		Imported Coal	6,32,350	Indonesia / South Africa / Australia	By Sea, Rail & Road (Covered trucks)
4. For manufacturing Induction Furnace (MS Billets) – 7,50,000 TPA					
a)	Sponge Iron		7,60,000	In-house	Covered Conveyor
b)	Pig Iron		72,000	In-house	Covered Conveyor
c)	Scrap		38,000	Open market, Baloda bazar	By Road through covered trucks
d)	Ferro Alloys		37,500	In-house	Covered Conveyor
5. For manufacturing Rolled Products / TMT bars / Structural Steel – 7,00,000 TPA					
a.	Billets / Ingots		7,50,000	In house generation	Covered Conveyor
b.	Coal for Gasifier (40000 Nm^3)+ PCI	Indian	1,26,000	Chhattisgarh/ Orissa	By Rail & Road through covered trucks
		Imported	80,600	Indonesia / South Africa / Australia	By Sea, Rail & Road (Covered trucks)
	Furnace Oil		40300	Local	By Road through tanker
6. For Ferro Alloys : 2x9 MVA (FeSi (or) SiMn (or) FeMn (or) Pig Iron					
6. (i) For manufacturing Ferro Silicon – 18,000 TPA					

S.No.	RAW MATERIAL		QUANTITY (TPA)	SOURCES	MODE OF TRANSPORT
a)	Quartz		27,360	Chhattisgarh/ Andra Pradesh	By Rail & Road through covered trucks
b)	Mill Scale		14,040	In-house	Covered Conveyor
c)	M.S. Scrap		630	Chhattisgarh	By Road through covered trucks
d)	LAM Coke		10080	Chhattisgarh	By Road through covered trucks
e)	Bag filter dust		1080	In-house	Pipeline
6. (ii) For manufacturing Silico Manganese - 36,000 TPA					
a)	Manganese Ore		58680	MOIL / OMC	By Rail & Road through covered trucks
b)	FeMn Slag		22248	In house generation	Covered Conveyor
c)	LAM Coke		13860	Chhattisgarh	By Road through covered trucks
d)	Quartz		7200	Chhattisgarh/ Andra Pradesh	By Rail & Road through covered trucks
e)	Bag filter dust		3600	In house generation	Pipeline
6. (iii) For manufacturing Ferro Manganese – 66,000 TPA					
a)	Manganese Ore		1,50,150	MOIL / OMC	By Rail & Road through covered trucks
b)	LAM Coke		24,090	Chhattisgarh	By Road through covered trucks
c)	Quartz		1980	Chhattisgarh/ Andra Pradesh	By Rail & Road through covered trucks
d)	Bag filter dust		10,560	In house generation	Pipeline
6. (iv) For manufacturing Pig Iron – 72,000 TPA					
a.	HG Iron ore		1,06,200	Chhattisgarh/ Orissa	By Rail & Road through covered trucks
b.	LAM Coke		35,280	Chhattisgarh	By Road through covered trucks
c.	Lime stone		29,520	Chhattisgarh/ MP	By Rail & Road through covered trucks
7. For Power Generation –CFBC power plant of 40 MW					
a.	Coal	Indian	2,48,400	Chhattisgarh/ Orissa	By Rail & Road through covered trucks
		Imported	1,60,000	Indonesia / South Africa / Australia	By Sea, Rail & Road (Covered trucks)
Note: **Railway siding is proposed which is at 0.5 Kms. from the Site.**					

3.6.2 Mode of Transport for Raw materials and finished products:

The major raw materials such as Iron Ore, Mn. ore & Coal will be transported through rail as Railway siding is envisaged for the present proposal. The other Raw materials will be transported through tarpaulin covered trucks.

3.6.3 Market of Final Products:

Final products which will be available for sale are Rolled Products of 7,00,000 TPA.

3.8 Availability of water its source, Energy / power requirement and source:

3.8.1 Water Requirement and its sources:

The water requirement for the proposed project will be **13,255 KLD**. Water required for process of manufacturing, cooling and domestic purpose. The water required for the proposed project will be met from Shivnath River. Water Permission from Water Resource department has already been received.

BREAK-UP OF WATER REQUIREMENT

S.No.	Water required for	Water Requirement (in KLD)
1.	For I/O beneficiation – 2.0 mtpa	1200
2.	For Pellet Plant – 1.5 mtpa	500
3.	For Sponge Iron Plant - 2200 TPD	900
4.	For Power Plant – 106 MW	7600
5.	For Steel Melting Shop – 7,50,000 TPA	1560
6.	For Rolling Mill – 7,00,000 TPA	850
7.	For Gasifier – 10x8000 m^3/hr	350
8.	For Ferro Alloys – 2x9 MVA	250
9.	Domestic consumption	45
	Total	**13255**

3.8.2 Sources of Energy/ Power and its sources:

Power required for the existing & present proposal is estimated approx. **136.2 MW**, which will be met from **106 MW Captive Power Plant** remaining power will be met from State Grid.

POWER REQUIREMENT FOR PROPOSED UNITS

S.No.	Plant	Power Consumption	Power Requirement (in MW)
1.	Iron Ore Beneficiation &Pelletisation	60 Kwh/ton	16.7
2.	DRI Kiln (Sponge Iron)	75 Kwh/ton	6.9
3.	Induction Furnace with LRF & CCM (Hot Metal / MS Ingots/ M.s. billets)	760 Kwh/ton	69.7
4.	Rolling Mill (Rolled Products / Structural	150 Kwh/ton	13.3

	Steels / TMT bars)		
5.	Gasifier for Pellet Plant & Rolling Mill	60 Kwh/ton	1.5
6.	Ferro alloys (2 x 9 MVA)	3000 to 8000 Kwh/ton	17.5
7.	Power Plant – WHRB (66 MW)	Aux. Consumption @ 10%	6.6
8.	Power plant – FBC (40 MW)	Aux. Consumption @ 10%	4.0
	Total		**136.2**

3.9 Generation and disposal of Wastes [Wastewater and Solid Wastes]:

3.9.1 Waste Water Generation:

- The effluent generated from I/O Beneficiation plant, Pellet plant, DRI kilns, Submerged Electric Arc Furnaces, SMS units will be recycled with closed loop cooling water system.
- Effluent from Rolling Mill will be sent to settling tank & will be recycled through closed circuit cooling system. Mill scales will be reused in SMS.
- Effluent from Gasifier will have mainly phenolic compounds and will be used in After Burning Chamber of existing DRI kilns for quenching and to regulate the temperature of the hot flue gas in accordance with inlet requirement of waste heat recovery Boiler
- Sanitary wastewater / sewage generated will be treated in proposed STP.
- Garland drains will be provided around all the raw material stacking areas

3.9.2 Solid Waste Generation and its disposal

The following is the Solid waste generation & method of disposal

S.No	Waste / By product	Quantity	Method of disposal
1.	Tailings from I/O Beneficiation	1200 TPD (4,00,000 TPA)	Tailing will be taken to filter press & recovered the water. Cake of tailing will be stored in tailing yard & it will given to nearby Ceramic Unit.
2.	Ash / Dust generated from Pellet plant	136 TPD (45,000 TPA)	Will be given to nearby Fly ash Brick manufacturers.
3.	Dolochar from DRI	440 TPD (1,52,000 TPA)	Will be utilized as fuel in proposed CFBC Power plant.
4.	Kiln Accretion Slag from DRI	20 TPD (6,840 TPA)	Will be used in road construction & given to brick manufacturers.
5.	Wet scrapper sludge from DRI	101 TPD (35,000 TPA)	Will be used in road construction & given to brick manufacturer.
6.	Ash / Dust generated from DRI kiln	397 TPD (1,36,800 TPA)	Ash generated is being given to Brick Manufacturers & nearby cement plant
7.	Slag from SMS	233 (70,000 TPA)	Slag will be crushed and after recovery of iron, after that it will be utilized for internal Road laying / given to Contractor.

S.No	Waste / By product	Quantity	Method of disposal
8.	Mill Scales from Rolling Mill	42 TPD (14,000 TPA)	Will be reused in proposed Ferro Alloy manufacturing & pellet plant.
9.	End Cuttings from Rolling Mill	64 TPD (21,000 TPA)	Will be reused in proposed SMS.
10.	Slag from Ferro Silicon Manufacturing Process	15 TPD (5,320 TPA)	Will be given to cast iron foundries.
11.	Slag from Silico Manganese Manufacturing Process	88 TPD (30,800 TPA)	Will be given to Contractor for Road Construction.
12.	Slag from Ferro Manganese Manufacturing Process	122 TPD (42,600 TPA)	Will be used in manufacture of Silico manganese as it contains high MnO_2.
13.	Ash generated from Gasifier (Pellet plant & Rolling Mill)	15.2 TPD (5000 TPA)	Will be given to nearby Fly ash Brick manufacturers.
14.	Tar generation from Gasifiers	1.8 TPD (594 TPA)	Will be used in Pellet plant / will be given to coal tar recyclers / agencies engaged in construction activities.
15.	Ash from Power Plant (with Indian Coal + dolochar)	324 TPD (1,11,780 TPA)	Ash generated is being given to Cement Plants / Brick Manufacturers.
16.	Ash from Power Plant (with imported Coal + dolochar)	56 TPD (19,200 TPA)	Ash generated is being given to Cement Plants / Brick Manufacturers.

3.10 Schematic representations of the feasibility drawing which give information of EIA purpose

The topographical map showing 10 km. radius of the Plant site is shown at Section 3.2 of this report.

Chapter – 4
SITE ANALYSIS

4.1 Connectivity

The proposed site is well connected with Rail and Road connectivity. The following table gives brief regarding connectivity of the proposed site:

Component		Description
Road	:	Plant is well connected to SH # 10 (Bhatapara to Baloda Bazar) at a distance of 12.5 Kms.
Rail	:	Nipania railway station – 3.5 Kms. (by Road)
Air Strip	:	Bilaspur Air port - 42 Kms. (by Road)

4.2 Land Form, Land use and Land ownership

Total land envisaged for the project is 156.09 Acres (63.5 Ha.). Total land is in possession of management.

S.No.	ITEM	Area in Hectares
1.	Private Land (acquired by the management)	156.909
2.	Govt. Land	NIL
3.	Forest Land	NIL
	Total land	**156.909**

4.3 Topography

Existing land is more or less flat without many undulations. There site is slightly slope towards Eastern side. Due to proposed project there will be some topographical changes will occur due to the excavations, construction activities pertaining to the project. The topographical map showing 10 km. radius of the project site is furnished in section 3.2.

4.4 Existing land use pattern:

4.4.1 Land use pattern of the Project site

Total extent of land area is 156.909 Acres (63.5 Ha.). The following is the Land use statement of the Plant Area.

Item	Area in Acres
Bulit-up area for Proposed Units including Admin.	48.000
Internal roads	16.000
Solid waste storage & Disposal	5.500
Raw material & product Storage Area including coal handling area	10.000
Tailing storage area	1.200
Water Storage Area	2.000
Greenbelt	52.000
Switch Yard	0.500
Truck Parking	5.000
Open areas	16.709
Total	**156.909**

4.4.2 Environmental Setting of the Project Site:

Below mentioned table gives brief regarding environmental setting of the project site:

S.No	Particulars		Distance from the site
1.	Nearest Village	:	Bakulahi (0.15 kms.) & Dhourabhata (0.35

			Kms.)
2.	Water bodies	:	Shivnath River- 5.9 Kms. Jamuniya Nadi -5.8 Kms. and Few other Seasonal Streams & ponds are present within 10 Km. radius of the plant.
3.	Reserve Forest / Protected Forest	:	Nil with in 10 Km. radius
4.	Industrial areas / cluster (MoEF&CC Office Memorandum dated 13th January 2010) & its subsequent amendments	:	Nil with in 10 Km. radius And also the Plant area does not fall in the areas given in NGT order issued on 10th July 2019.
5.	National Park/ Wild life sanctuary / Biosphere reserve / Tiger Reserve / Elephant Corridor / migratory route for Birds	:	There are no notified National Park/ Wild life sanctuary / Biosphere reserve / Tiger Reserve/ migratory routes for Birds with in 10 Km. radius of the plant.
6.	Costal Regulation Zone [CRZ]	:	Nil with in 10 Km. radius
7.	Interstate border	:	Nil with in 10 Km. radius (110 Kms. Madhya Pradesh)
8.	Nearest National Highway / State Highway	:	SH # 10 (Bhatapara to Baloda Bazar) – 9.0 Kms.
9.	Nearest Railway Station	:	Nipania Railway Station – 2.3 Kms.

4.5 Existing Infrastructure

The proposed project is Greenfield project. Infrastructure facilities such Power, Approach Roads, Water pipeline will be provided for the proposed project.

4.6 Soil classification

The Baloda Bazar district consist of majorly Black, Red ,Sandy & Lomy soil.

4.7 Climatic data from secondary sources

The temperatures are highest on average in May, at around 35.7 °C. In December, the average temperature is 20.4 °C. It is the lowest average temperature of the whole year

This District has a tropical climate. In winter, there is much less rainfall than in summer. In Baloda Bazar, the average annual temperature is 27.1 °C. In a year, the average rainfall is 1225 mm.

The least amount of rainfall occurs in November. Most precipitation falls in July.

4 (viii) Social Infrastructure Available

The basic social infrastructure facilities like Hospitals, Schools, Colleges, Banks etc. are available in the in Bhatapara Town which is 11.6 Kms. from the Plant.

Chapter – 5
PLANNING BRIEF

5.1 Planning Concept (type of industries, facilities. transportation etc)

It is proposed to establish an Integrated Steel plant and will be taken up in the 156.09 Acres of land. Township will be taken up outside the plant premises. The transportation of raw materials and finished products will be by rail and road. Railway Siding is available at 0.5 Kms. distance. The present land use pattern of the site is Private Barren land and will be converted for Industrial purpose.

5.2 Population Projection:

There are no major human settlements in the vicinity of the plant. The manpower requirement will be sourced from the local areas to the extent possible; hence not much of settlement of outside people in the area. However population concentration may increase around the project site due to increase in ancillary activities.

5.3 Land use planning:

The total land envisaged for the proposed project is 156.909 Ac. (63.52 Ha) in which 108.60 Acres (43.969 Hect.) land is already industrial diverted. Out of which 1/3rd of the area will be earmarked for greenbelt. Other facilities such as Plant & Machinery, Raw Material Storage, Internal Roads, Water storage, RWH Structures will also be provided within the plant premises.

5.4 Amenities/Facilities.

The facilities like drinking water, toilets, rest room and first aid will be provided for employees.

Chapter – 6
PROPOSED INFRASTRUCTURE

6.0 Proposed Infrastructure

The total land envisaged for the proposed project is 156.909 Acres (63.52 Ha.) in which 108.60 Acres (43.969 Hect.) land is already industrial diverted. Out of this 33% area will be earmarked for greenbelt. Railway Siding is available at 0.5 Kms. distance. **Plant layout showing proposed facilities is shown as Figure 3.6.**

6.1 Industrial Area (Processing Area).

- Facilities like Plant & Machinery, Raw Material Storage, Internal Roads, Water storage, RWH Structures, Office Building will also be provided within the project site.

- The layout as a whole ensures uni-directional flow of materials within the plant as well as in and out of the plant.

- Utility Services are so located as to give minimum lengths of piping and cabling to ensure economy in CAPEX and OPEX.

- Environmental aspects, pollution control and safety measures are accorded due importance.

- Internal Roads are planned to ensure smooth flow of intra-plant traffic and provide approach for installation and maintenance of plant facilities.

6.2 Residential Area (Non Processing Area).

Township / Colony will be established outside the Plant Boundary, however facilities like Admin building, canteen, rest room and indoor games facilities will be provided in the plant premises.

6.3 Green Belt

52 Ac. (21 Ha.) of Greenbelt will be developed as per CPCB norms in 33% of the total area.

S.no	PLANT CONFIGURATION	CAPACITY
1	COAL GASIFICATION PLANT (PGP)	10 x 8,000 NM^3 /HR
2	PELLET + BENEFICATION PLANT	2 X 7,50,000 TPA OF PELLETS
3	a) 2 x 650 TPD DRI KILNS b) 2 x 350 TPD DRI KILNS c) 2 X 100 TPD DRI KILNS	a) 4,40,000 TPA b) 2,42,000 TPA c) 68,000 TPA TOTAL=7,50,000 TPA OF SPONGE IRON
4	106 MW POWER PLANT	a) 66 MW:WHRB b) 40 MW:CFBC
5	STEEL MELTING SHOP a) 5 x 30 Ton IMF b) 5 x 20 Ton IMF c) 2 x Continious Caster d) 2 x 35 Ton LRF	7,50,000 TPA OF HOT METAL / M.S. BILLETS / M.S. INGOTS
6	7 LTPA ROLLING MILL	2 x 3,50,000 TPA OF ROLLED PRODUCTS
7	2 x 9 MVA FERRO ALLOYS	a) Silico Manganese : 36000 TPA b) Ferro Manganese : 72000 TPA c) Ferro Silicon : 18000 TPA d) Pig Iron : 72000 TPA

S.no	LEGEND
1	GASIFIER+ COAL STOCK
2	PELLET + BENEFICATION PLANT
3	IRON ORE FINES STOCK YARD
4	PELLET STORAGE YARD
5	DRI UNIT
6	CFBC + CHAR SHED
7	POWER PLANT + COOLING TOWER (66 MW:WHRB) (40 MW:AFBC)
8	FERRO ALLOY
9	STEEL MELTING SHOP WITH CONTINIOUS CASTER
10	ROLLING MILL
11	CENTRAL STORE
12	ADMINISTRATION BLDG
13	TIME OFFICE
14	3* SECURITY OFFICE
15	WATER RESERVOIR
16	HEALTH CENTRE
17	2 & 4 WHEELER PARKING
18	SWITCH YARD LOCATION
19	IRON ORE HANDLING PLANT + STOCK YARD
20	COAL HANDLING PLANT
21	TRUCK PARKING
22	RECUPERATOR
23	D.M PLANT
TOTAL AREA =156.9 ACRES (63.5)	
GREEN BELT AREA = 52 ACRE(33%)	

REAL ISPAT & POWER LTD.

PROPOSED INTEGRATED STEEL PLANT

Located at: Bakulahi & Dhourabhata Villages, Bhatapara (T), Baloda Bazar (D), C.G

PLANT LAY-OUT

6.4 Social Infrastructure.

Social infrastructure will be developed as per need based in the Villages of the vicinity of the project.

6.5 Connectivity:

The proposed site is well connected with Rail and Road connectivity. The following table gives brief regarding connectivity of the proposed site:

Component		**Description**
Component		**Description**
Road	:	Plant is well connected to SH # 10 (Bhatapara to Baloda Bazar) at a distance of 12.5 Kms.
Rail	:	Nipania railway station – 3.5 Kms. (by Road)

6.6 Drinking Water Management:

The daily requirement of water for drinking and sanitation is estimated @ 45 L/person for a total staff strength including contractor personnel of about 1000 persons, which is 45 KL. Considering consumption in drinking and some losses, 80% of this quantity shall be recovered through STP and used in gardening, dust suppression etc.

6.7 Sewerage System.

Adequate Toilet facilities will be provided. Considering consumption in drinking and some losses, 80% of this quantity will be sent to STP & after treatment it be used in gardening, dust suppression etc.

6.8 Industrial Waste Management.

- The effluent generated from I/O Beneficiation plant, Pellet plant, DRI kilns, Submerged Electric Arc Furnaces, SMS units will be recycled with closed loop cooling water system.
- Effluent from Rolling Mill will be sent to settling tank & will be recycled through closed circuit cooling system. Mill scales will be reused in SMS.
- Effluent from Gasifier will have mainly phenolic compounds and will be used in After Burning Chamber of existing DRI kilns for quenching and to regulate the temperature of the hot flue gas in accordance with inlet requirement of waste heat recovery Boiler
- Sanitary wastewater / sewage generated will be treated in proposed STP.
- Garland drains will be provided around all the raw material stacking areas

6.9 Solid Waste Management.

- Tailings will be stored in Tailing pond & will be given to Ceramic units.
- Dolochar generated from the proposed Sponge Iron Kilns will be given to near by Power plants.
- Ash from DRI kiln will be given to Brick manufacturers.
- Slag generated from Induction Furnace melting will be crushed to recover metal. After recovery of Iron the inert material left over will be used as / will be given for filling material for low lying areas and for road making aggregate.
- Mill scales from Rolling mill will be utilized in Ferro Alloy units.
- End cuttings from Rolling mill will be recycled back to Induction Furnace.
- Municipal solid wastes (Organic Bio-degradable) from the Plant will be composted and will be used as manure for the greenbelt. Inorganic wastes (Non-biodegradable) will be sent to KSPCB Authorized Recyclers.
- Fly ash from CFBC power plant will be given to near by Cement Plants.

6.10 Power requirement & its source.

Power required for the present proposal is estimated as approx. 136.2 MW, which will be partly met from 106 MW Captive Power Plant and the balance will be sourced from State Grid.

Chapter – 7
Rehabilitation and Resettlement Scheme

No rehabilitation and resettlement is required as there are no habitations in the proposed project site of 156.909 Acres.

Chapter – 8
Project Schedule & Cost Estimates

8.1 Likely date of start of construction:

Complete project is planned to be implemented in phases. Each phase is aimed to enable RIPL produce a more value added product to improve the viability of the plant and generate funds for implementation of the next phase. The following is the proposed schedule for approval and implementation

S.No.	Description	Plant Configuration	Production Capacity	Duration From the Date of receipt of EC & Financial Closure													
				1st Year		2nd Year		3rd Year		4th Year		5th Year		6th Year		7th Year	
1	Iron Ore Beneficiation	2.0 mtpa	2.0 mtpa														
2	Pelletisation Plant	2 x 0.8 mtpa	1.6 mtpa														
2	DRI kilns (Sponge Iron)	2x100 TPD	69,000 TPA														
3	DRI kilns (Sponge Iron)	2x350 TPD	2,42,000 TPA														
4	DRI kilns (Sponge Iron)	2x650 TPD	4,49,000 TPA														
5	Induction Furnace with LRF +CCM (Hot metal / MS Ingots/ billets)	5 x 30 Tons	4,50,000 TPA														
6	Induction Furnace with LRF + CCM (Hot metal / MS Ingots/ billets)	5 x 20 Tons	3,00,000 TPA														
7	Rolling Mill (Rolled Products / Structural Steels / TMT bars l)	1 x 1050 TPD	3,50,000 TPA														
7	Rolling Mill (Rolled Products / Structural Steels / TMT bars l)	1 x 1050 TPD	3,50,000 TPA														
8	Gasifier + PCI for Pellet Plant & Rolling Mill	80000 Nm^3/Hr	10 x 8000 Nm^3/Hr														
9	Ferro alloys	2 x 9 MVA	2 x 9 MVA														

8.2 Estimated project cost:

The estimated Project Cost for the proposed project will be of **Rs.930.68 crores.**

S.No.	Plant	Project Cost (Rs. In Crores)
01	IRON ORE BENEFICATION PLANT (2.0 mtpa)	20.00
02	PELLET PLANT (1.5 mtpa)	150.00
03	COAL GASIFIER + PCI FOR PELLET PLANT & ROLLING MILL (10 x8000 Nm^3)	10.00
04	SPONGE IRON PLANT (7,60,000 TPA)	200.00
05	POWER PLANT (WHRB: 66 MW & CFBC : 40 MW)	318.00

S.No.	Plant	Project Cost (Rs. In Crores)
06	STEEL MELT SHOP WITH CCM (7,50,000 TPA)	80.00
07	LADLE REFINING FURNACE (LRF) (7,00,000 TPA)	30.00
08	ROLLING MILL (2 x3,50,000 TPA) with STANDBY REHEATING FURNACE 50 TPH	80.00
09	FERRO ALLOYS PLANT (2 x 9 MVA)	30.00
10	For Corporate Environment Responsibility (CER) (for Greenfield projects as per Ministry's Office Memorandum vide F.No. 22-65/2017-IA.III dated 1st May 2018)	12.68
	TOTAL	**930.68**

Chapter – 9
Analysis of proposal

9.1 Financial and social benefits:

With the implementation of the proposed project, the socio-economic status of the local people will improve substantially. The land rates in the area will improve in the nearby areas due to the proposed activity. This will help in upliftment of the social status of the people in the area. Educational institutions will also come-up and will lead to improvement of educational status of the people in the area. Primary health centre will also be developed by us and the medical facilities will certainly improve due to the proposed project.

9.2 Socio-Economic Developmental Activities

The management is committed to uplift the standards of living of the villagers by undertaking following activities / responsibilities as the part of Corporate Social Responsibility.

BASELINE DATA COLLECTION (1st March 2018 to 31st May 2018)

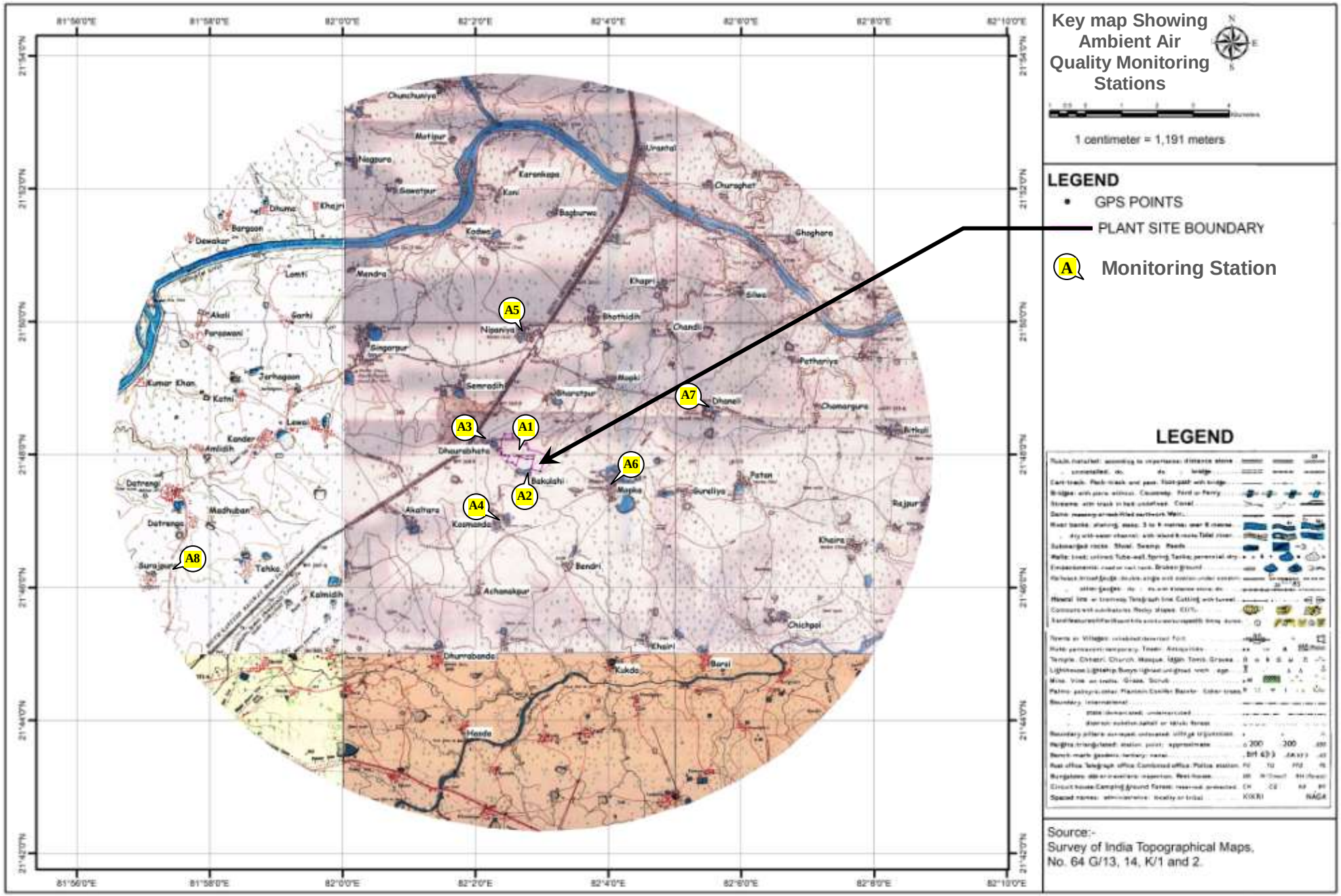
RIPL commenced Baseline Data Collection from 1st October 2019 and will be completed by 31st December 2019.

Wind rose plotted as per nearest IMD data (Pendra Road, Bilaspur region) for the period (1971 – 2000) for October, November & December months.

The wind rose shows that winds are predominantly blowing from **North to South** direction.

Ambient Air Quality Monitoring Stations

S.No.	STATION	DIRECTION w.r.t Plant	DISTANCE w.r.t Plant (in Kms.)	CRITERIA FOR SELECTION
1	Project Site	---	---	Representing Project Site
2	Bakulahi	S	0.15	Representing Nearest Habitation in Downwind direction.
3	Daurabhatha	W	0.35	Representing Habitation in Crosswind receptor
4	Kosmanda	S	1.2	Representing Habitation in downwind direction
5	Nipaniya	N	2.3	Representing Habitation in upwind direction & near Railway station
6	Mopka	E	1.7	Representing Habitation in Crosswind receptor
7	Dhaneli	NE	4.3	Representing Habitation in Upwind Direction
8	Near Surajpura village	SSW	9.4	Representing Industrial activity in Crosswind receptor


Key map Showing Ambient Air Quality Monitoring Stations
1 centimeter = 1,191 meters
LEGEND
GPS POINTS
PLANT SITE BOUNDARY
A Monitoring Station
LEGEND
Source:-
Survey of India Topographical Maps,
No. 64 G/13, 14, K/1 and 2.
A1
A2
A3
A4
A5
A6
A7
A8
Chuchuniya
Matiyur
Nagpura
Sawatpur
Karonkapa
Kori
Bagburwa
Kadwa
Unantal
Churaghat
Ghoghara
Dhuma
Khajri
Bargaon
Dewakar
Lonti
Mandra
Akoli
Garhi
Parasawani
Singarpur
Nigariya
Bhothidih
Chandi
Khapri
Silwa
Patthariya
Jarhagaon
Kumar Khan
Katni
Semradih
Bhanstpur
Dhanoli
Chamargura
Birkuli
Lawai
Kander
Amlidih
Dhurabhata
Bakulshi
Mapka
Patan
Gurelliya
Rajpur
Datrenga
Madhuban
Akaltara
Kasmanda
Khairs
Surajpur
Tehka
Kalmidih
Bendri
Achanakpur
Chichpol
Ehsini
Dhurrabanda
Kukda
Barsi
Hasda