Status of sponge iron plants in Orissa

Prepared
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Introduction

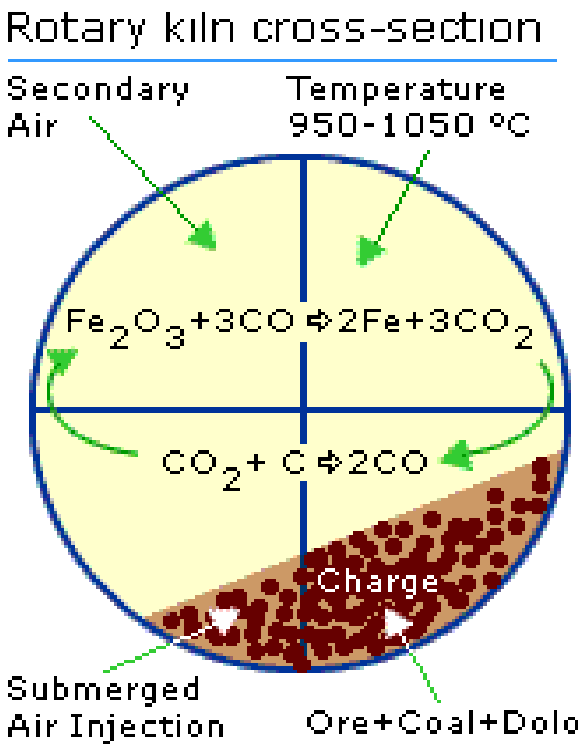
Globally iron ore is the major feedstock for BF-BOF steelmaking for the production of about 60 per cent of world crude steel. But it requires various types of treatment of raw materials, involves high capital costs and substantial investment on infrastructure. It also leads to environmental problems and has a long gestation period. To find a way out of these shortcomings of BF-BOF process, EAF steelmaking was introduced more than 100 years back. The increasing trend in scrap prices in the nineties and its short supply led to the use of sponge iron / Direct Reduced Iron (DRI) for use in the charge-mix for steelmaking. DRI is a high quality metallic product produced from iron ore, pellets etc as a feedstock in Electric Arc Furnaces (EAFs), Blast furnaces and other iron and steelmaking processes. Hot Briquetted Iron (HBI) is a denser and compacted form of DRI designed for the ease of shipping, handling and storage. DRI can be used in steel units where the DRI reduction unit is situated at the site of the steelmaking plant.

The National Steel Policy of 2005 envisages production of 110 MT of steel by 2020, out of which 30% will be in Sponge Iron route. Further 50% of the sponge capacity will be through small-medium coal based Sponge Iron units, while the rest will be made up by sponge production in gas based Sponge Plants and large Sponge based integrated steel plants. Due to boom in steel market during 2000-2005, there is mushroom growth of coal based sponge iron plants and integrated steel plants in iron and coal rich states like Orissa, Jharkhand, Chhatishgarh, and West Bengal & Andhra Pradesh. Orissa is endowed with vast resources of Iron Ore & coal, which are essential inputs of steel industry. The state has a major reserve of high grade iron ore (+65% Fe) and non coking coal. Most of the sponge iron plant are located in Sundergada & Keonjhar district as they depends upon the high grade iron ore (Hematite) available in these districts. How ever from pollution point of view, sponge iron plant is categorized in red industry (highly polluting industry). It mainly contribute to generation of solid waste & air pollution. In orissa, it has been found out that most of the sponge iron units are located in clusters thus significantly contributing to wards pollution in the area. Sponge iron plants are located in Cluster at areas like Kuarmunda, Kalunga, Bonei, Lathikatha, Rajgangpur of sundergada district ,

Rengali of sambalpur district. It has been found out that the cost of growth of sponge iron plants in these areas is being borne by local people.

Technology involved

Production of Steel through the conventional blast furnace requires coking coal of which India has limited reserves. Therefore, evolution of a technology for the reduction of Iron Ore using abundantly available non-coking coal was contemplated, giving birth to direct reduction Iron Technology (DRI).



The process of sponge iron involves the removal of oxygen from iron ore. During this process, the departing oxygen causes micro pores in the ore body making it porous. The final product, when observed under a microscope, resembles a honeycomb structure looking spongy in texture, hence the name sponge iron. Iron ore (haematite) and non-coking coal are the prime raw materials for the production of sponge iron. These are charged into a rotary kiln in requisite proportion along with some dolomite. Coal plays a dual role in the process by acting as a reductant as well as a fuel for providing heat to maintain the requisite temperature inside the kiln at 950-1050C. The reduction process occurs in solid state. The crucial factor in this reduction process is the controlled combustion of coal and its conversion to carbon monoxide to remove oxygen from the iron ore. The overall process requires a duration of approximately ten to twelve hours inside the kiln, during which iron ore is optimally reduced and discharged to a rotary cooler for cooling below 120°C., before coming out into the finished product circuit

Raw Material for sponge iron plant

Coal: Non-coking coal having certain important parameters is being used for the direct reduction of iron ore . Important factors determining coal quality are:

- Chemical properties such as fixed carbon, ash content, volatile matter, etc.: &
- Physical properties viz, reactivity and ash fusion temperature.

In Orissa scenario, all most all the sponge iron units use the coal from various coal mines situated at talcher, sambalpur & sundergada. The ash content of coal of Orissa varies from 30-35%. In the meantime, Board has also made it mandatory for sponge iron plans to use washed coal with ash not exceeding 35%.

Iron Ore: In sponge iron making, iron ore is reduced in solid state. Unlike in the conventional steel melting processes, the gangue content of iron ore cannot be separated as a slag. Therefore, it becomes imperative to select an ore with a high Fe content and a low gangue content, to optimise yield during steel making. Apart from this, to ensure a better kiln campaign life and output, the iron ore is made to undergo a series of other tests viz. shatter, tumbler & abrasion indices, reducibility etc. in Orissa, the sponge iron units used the iron ore explored from Keonjhar & sundergada district.

Dolomite: Dolomite acts as a de-sulphuriser in the process, removing sulphur from the feed mix during the reduction process. It is mixed in small proportion along with other raw materials before charging into the kiln. Mostly dolomite from Sundergada is being used in Orissa based DRI plants.

DRI is a high quality metallic product produced from iron ore, use as a feedstock in Electric Arc Furnaces (EAFs), Blast furnaces and other iron and steelmaking processes. Hot Briquetted Iron (HBI) is a denser and compacted form of DRI designed for the ease of shipping, handling and storage. DRI can be used in steel units where the DRI reduction unit is situated at the site of the steelmaking plant.

Composition of DRI

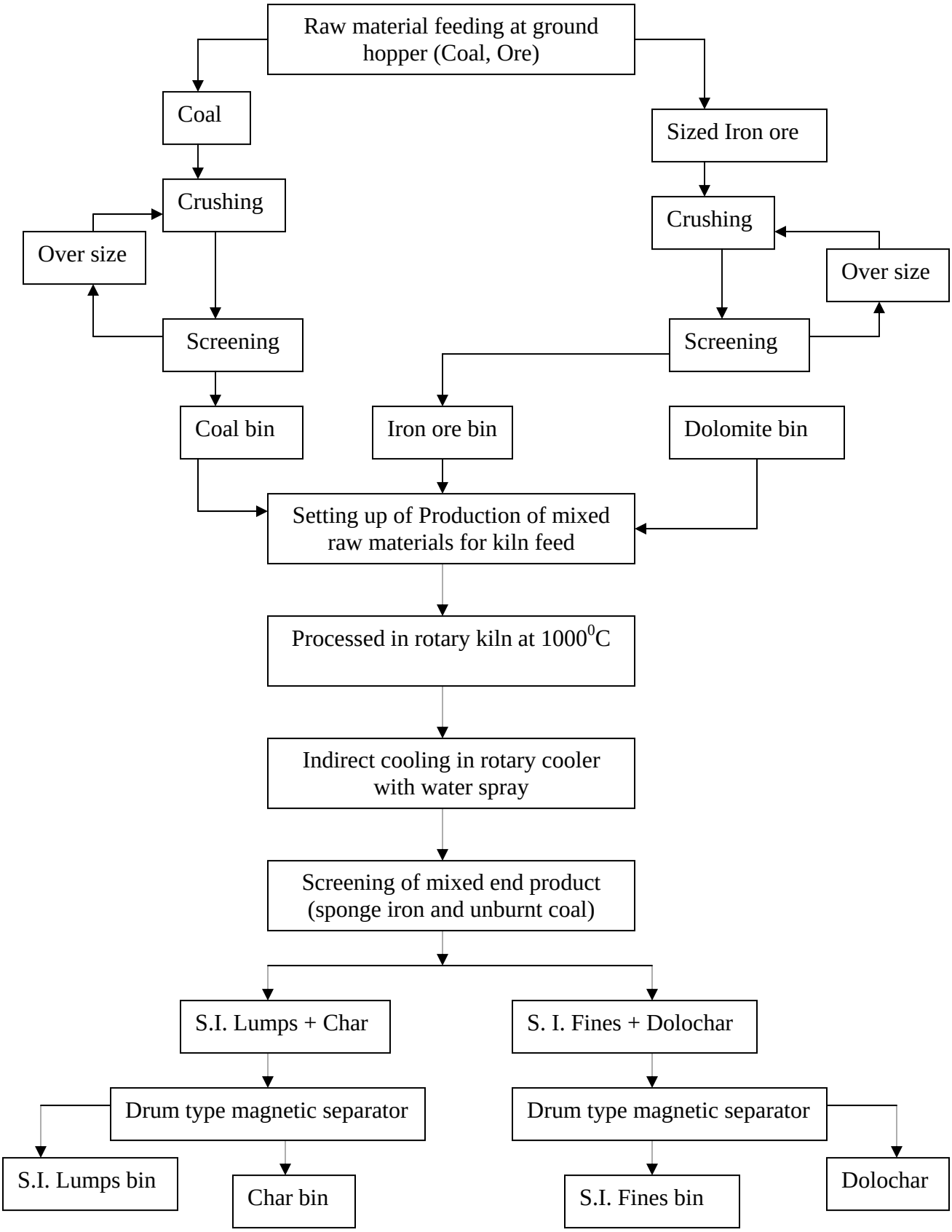
The usual chemical composition of DRI / HBI traded in the international markets is as follows:

Table:1 The composition of DRI

Contents	**%**
Total Fe	94-95
Metallic Fe	88-90
Degree of Metalisation	93-95 $\pm$ 1.2
Carbon	1.0 - 1.5 $\pm$ 0.3
Sulphur	0.0005 - 0.015
Phosphorous	0.02 - 0.09
Silica	1.0 - 2.0

For maximum yield, the metallic iron content should be at the highest possible level with sulphur and phosphorous as low as possible. Gangue should be as low as possible with Silicon less than 2.5 per cent to ensure lower slag volume, less power consumption and for achieving higher productivity. Size of the DRI should be less than 3 mm fraction to prevent losses during charging and handling operations. The density should be high to facilitate faster melting which in its turn will save energy

Fig. 1 Process Flow Chart For Sponge Iron Unit



A number of processes exist for the production of DRI. These may be grouped into (a) Coal-based processes and (b) Gas-based processes. At present India is the largest producer of coal based DRI and the 620,000 tpy coal- based project of Jindal Steel and Power Ltd. is the second biggest producer of coal-based DRI in the world. According to one survey by Joint plant committee in 2005-06[1], the growth of Indian Sponge Iron Industry has been spectacular. From a production of only 10,000 tonnes in 1980, it reached a level of 1.25 million tonnes in 1991-92 which has further increased to 5.44 million tonnes in 2000-01. India was the third highest producer of DRI in the world in 2000.

Evolution & growth of sponge iron plant in Orissa: Orissa Sponge Iron Limited (OSIL), was established in the year 1979 under the aegis of TFRI and Industrial Promotion & Investment Corporation of Orissa ltd. (IPICOL, A Government of Orissa Undertaking) with a 100000 TPA coal based Sponge Iron production facility at Palaspanga area of Keonjhar district. At present, (according to State pollution control board data as on 30.04.2009), there exists around 107 Number of sponge iron plants in the state[2].

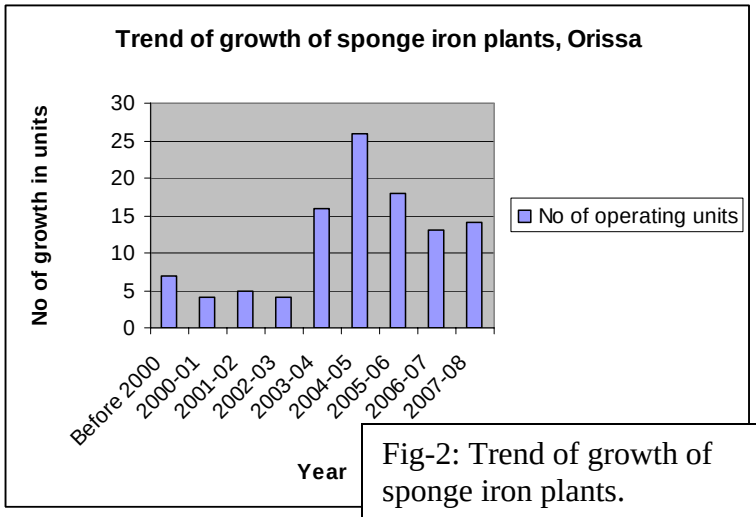


Fig-2: Trend of growth of sponge iron plants.

The trend of growth of sponge iron plants in orissa is given in table- which indicates that during 1999-2000, only 7 plants were operating in the state. This number increases to 11 during 2000-01, 16 during

[1] Highlights of Survey of sponge iron industry,2005-06 prepaired by Joint plant committee.
[2] Annexure - 1

2001-02, 20 in 2002-03, 36 during 2003-04, 62 during 2004-05, 80 during 2005-06, 93 during 2006-07 & to 107 during 2007-08. At present (31.12.2008) there are 107 number of sponge iron units operating in the state.

Distribution of sponge iron plants in state: The sponge iron plants are mostly distributed in 9 districts of state. Out of the total 107 number of sponge iron plants located in Orissa, sundergarh district has maximum number (47) followed by Keonjhar (20), Jharsuguda (13), sambalpur (10), Jajpur (5), Dhenkanal (4), Cuttack (4), Angul (3) and Mayurbhanja (1).

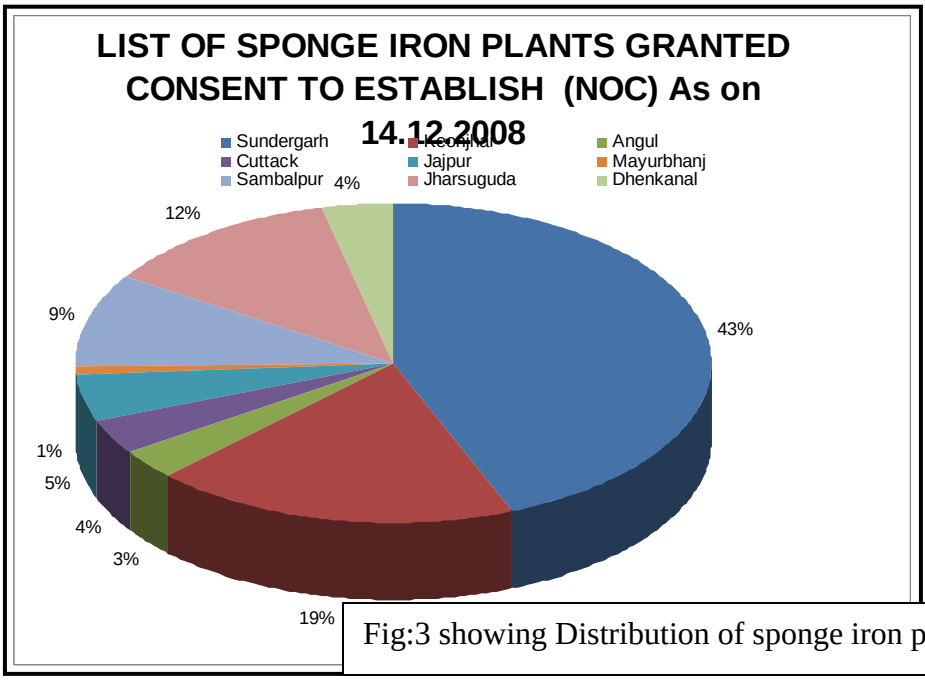


Fig:3 showing Distribution of sponge iron plants in orissa.

In Sundergarh district, Maximum numbers of sponge iron plants are located in clusters. Maximum numbers of plants are confined to Panposh subdivision. It has been found out that a large number of plants are located at Kalunga (11) , Kuanarmunda (9) industrial complex & Bonei (11) & Kuanrmunda area (15 no) . The reason of development of sponge iron plants in cluster is because of the easily availability of raw materials & communication facility in those area. Similarly in Keonjhar district, maximum number of sponge iron plants is found to be mushroomed at Badbil-Joda area (12). Jharsuguda district contain 10% (13) sponge iron plant of state followed by sambalpur 9% (10). District like Dhenkanal, jajpur , Anugul and Cuttack followed the top four district with

4,4,4 and 3 percentage respectively. Mayurbhanj is the only district having a single sponge iron plant located at sukruli .

According to SPCB, Orissa data regarding the production capacity & number of kiln in the state as on 31.12.2008, it is found at 33140 TPD & 247 respectively. From the data obtained it is found out that kilns having capacity of 100 TPD is highest number in state (150) and the production rate of these kilns is found to be at 15100 TPD followed by 500 (16 number, 8000TPD) & 50 (47 number) & 350 TPD kiln (13 number). The TATA sponge iron plant at Beleipada, Keonjhar and Arati steel located at Ghantikhal, Cuttack are the plants having 500 TPD kiln capacity. The details about no of Sponge iron plants operating in different districts of Orissa having kiln capacity are shown the table number.

Table: 2- Sponge iron plants operating in different districts of Orissa
(Number of kilns and production capacity) as on 31.12.2008

			Capacity of Rotary Kilns in Operation (Tonnes per Day)						Total No. of Kilns
Sl. No.	District	No. of Units operating	25 TPD Kilns	40 & 50 TPD Kilns	100 TPD Kilns	300 TPD Kilns	350 / 375 TPD Kilns	500 TPD Kilns	
1	Sundergarh	47	01	4/33	71	01	1/nil	Nil	111
2	Keonjhar	20	Nil	5/10	31	03	2/1	2	54
3	Angul	03	Nil	Nil	03	01	Nil	Nil	04
4	Dhenkanal	04	Nil	Nil	2	01	1/Nil	06	10
5	Jajpur	05	Nil	02/Nil	05	Nil	2/Nil	2	11
6	Mayurbhanj	01	Nil	Nil	02	Nil	Nil	Nil	02
7	Sambalpur	10	Nil	Nil/01	10	Nil	04/Nil	05	20
8	Jharsuguda	13	Nil	Nil/01	22	02	3/Nil	Nil	28
9	Cuttack	04	Nil	Nil/02	04	Nil	Nil	01	07
	Total	107	01	11/47	150	08	13/01	16	247 nos.
	Sponge produced per day or per annum (TPD/ MTA)		**25**	**2790**	**15000**	**2400**	**4925** (1x375+350 x13= 4925)	**8000**	**33140 TPD**

Clusters of sponge iron units in Orissa : In Orissa, a number of sponge iron unit clusters are found in districts like sundergada & Keonjhar. In sundergada, the clustures are located at Kuarmunda, Kalunga, Rajgangpur & Bonei area. Similarly at Keonjhar the units are located at Joda-Badbil area. The sambalpur- Jharsuguda clusture is located between rengali & Jharsuguda Border area. The details about the cluster are as follows:

Rajgangpur: Located at a distance of 10 km from Rourkela, this area has 6 number of sponge iron plants operating at a radius of 20 km. Some sponge iron plants are even located only 100 meter far from National highway. Apart from sponge iron unit, a cement unit of orissa cement limited (OCL) is also operating in this area.

Table-3: Details about affected population due to cluster of plants, Rajgangpur.

Sl No	**Parameter**	**Socio-economic Profile within 20 km radius**
	Population	
1	Total Population	45396
4	SC	2604
5	ST	39071
7	Population Density (No./sq. km)	144
8	Total households	8662
11	Marginal Workers	5688
12	Cultivators	16722.69
13	Other Workers	17620.9
14	Total working Population	14801
No of sponge iron unit operating	**6 numbers**	

Kuarmunda: Kuarmunda is located at a distance of 12 km far from Rourklea city. 9 number of sponge iron units are operating in this area. Neepaz metalics, one of the large sponge iron unit of state is operating at this area.

Table-4: Details about affected population located at Kuarmunda sponge iron unit cluster.

Sl No	Parameter	Socio-economic Profile within 20km area.
	Population	
1	Total Population	51264
4	SC	3309
5	ST	37286
7	Population Density (No./sq. km)	163
8	Total households	10429
10	Main Workers	12421
11	Marginal Workers	9973
12	Cultivators	19358.42
13	Other Workers	20116.4
14	Total working Population	22394
No of sponge iron units operating	**9 numbers**	

Kalunga: Kalunga is located at 8 km far from Rourkela city and 4 km from Rajgangpur area. In this area, 11 number of sponge iron unit s are operating within a radius of 10 km. Apart from this, a number of other plants like cement plant (chariot cement ltd) are also operating in this area.

Table-5 : Details about affected person in Kalunga sponge iron cluster unit.

Sl No	Parameter	Study area
	Population	
1	Total Population	18618
4	SC	1026
5	ST	14241
7	Population Density (No./sq. km)	60
8	Total households	3874
	Occupational Pattern	
10	Main Workers	5290
11	Marginal Workers	3392
12	Cultivators	4183.482
13	Other Workers	9499.99
14	Total working Population	8682
No of sponge iron units operating	**11 numbers**	

Bonei: Located at a distance of 75 km from Rourkela city, Bonei is a small city situated in the bank of river Brahmani. Due to easy access to iron ore , dolomite & water, 11 number of sponge iron plants are operating in this area.

Apart from this cluster's are also located at Joda-Badbil area of Keonjhar district & Rengali area of Sambalpur district

Cost Benefit analysis of a sponge iron plant: Orissa having major reserves of high grade iron ore (+ 65% Fe) and non coking coal has attracted many industrialists to install coal based sponge iron plants. Most of the sponge iron plants are located either in sundergada or in Keonjhar district as they depend upon on high grade iron ore mostly from Joda-Badbil or Koida area. Similarly the units use non coking coal from M/s Mahanadi coalfields ltd (both from Talcher & Ib valley). It has been found out that most of the units are located adjacent to rivers. Running a sponge iron unit in a state like Orissa is found to be quite profitable. It has been estimated that running a DRI unit having production of 100 TPD bears a profit of Rs 8.25-14.85 crore/annum. The sponge iron industry is found to grow in an unplanned and haphazard manner as it is found to be a profitable business. These units are comparatively easy to setup as they can be established with the help of local fabricators and suppliers. The initial investment is found to be just 7-12 crore for a 100 TPD sponge iron unit which is recovered in just 1-1.5 year as the profit margin is quite large. The business is also found to be less risky as all the raw materials are largely found in the state & transportation costs is quite less . These units are taking full advantage of various gaps & loopholes existed in our existing system thus gaining a huge amount. It has been found out that sponge iron units are putting less emphasis on pollution mitigation such as operating ESP (electro static precipitator) to arrest the dust, releasing effluent in to nearby river, depositing char fines near to public places by taking the advantage of our less stringent rules & regulation thus saving a huge amount. Similarly labours are paid very less (it has been found out that a person is paid Rs 75-80/day for 12 hours). It has been found out that in order to use the

sponge iron made from these units, a large number of electric arc, induction and mini blast furnaces have came up in state. Integrated steel plant like Bhusan steel plant, Jindal steel ltd, VISA steel plant ltd are producing DRI pellets which are utilized in their EAF.

Table-6: Economic Analysis of a tonne of DRI in a 100 TPD unit.

In puts	Consumption	Rate (Rs)	Cost (Rs)
Iron ore	1.6 tonnes	3000-3400/tonne	4800-5400
Coal	1.5 tonnes	1800-2000/tonne	2700-3000
Dolomite	0.035 tonnes	300/tonne	10.5
Fuel oil	3.5 liters	30 liters	105
Power	75 KW/h	4.5-5.0 KW/h	337.5-375
Consumables, operation and maintenance			100
Labour	About 75-100 persons are employed in a 100 tonne plant	100-200 person employed	200-300
Total production cost per tonne			Approx 8250-9350
Selling cost per tonne			Approx 12000-13000
Gross profit margin before tax per tonne			Approx 25oo-4500
Annual profit margin before tax.			**8.25-14.85** crores

Source- Green rating project, Centre for science and Environment.

Pollution potential of sponge iron plants: Sponge iron plants are found to be highly resource inefficient and polluting one. They use high-grade iron ore and high grade coal. A typical 100 TPD sponge iron plants consumes 160-175 tonnes of iron ore, 120-150 tonnes of coal, 3.5 tonnes of dolomite and 120-160 tonnes of water everyday. In return they emit 180-200 tonnes of carbon monoxide, 1-2 tonnes of dust (if they are equipped with required pollution control requirement , otherwise dust emission can be high as 10 tonne per day), 25-30 tonnes of char, 10-15 tonnes of dust from pollution control equipment and 2.5-3.5 tonnes of kiln accretion every day. So all total it would be 230-250 Tonnes per day.

Fig-4: Garbage Factor for a one tonne of sponge iron unit.

In Put		Out put
1.6-1.75 tonnes of Iron ore		**1.8-2.0 t0nnes of CO_2**
1.2-1.5 tonnes of coal		**0.25 tonnes of dust**
0.035-0.05 tonnes of dolomite		**0.29 tonnes of coal char**
1.5-2.0 tonnes of water		**0.02 tonnes of kiln accretions**
		0.2 tonnes of SO2, water vapour
		Water vapour

Source- Down to earth September 15, 2006

The major problems with Indian sponge iron industry are that these are mostly coal-based units. Coal based sponge iron units are found to be extremely polluting. While globally gas based DRI is regarded as cleanest one, in Indian scenario majority of them are coal based. Almost 80 percent of the coal based sponge iron plant comes from India and about 60 percent of this production comes from the small scale industry in the unorganized sector. According to highlight findings of "survey of Indian sponge iron industries" report by Joint plant committee in 2005-06 , out of 150 surveyed sponge iron

units, only 3 are found to be natural gas based while rest 147 are coal based units. It has been found out that a number of plants are locally constructed and lack required pollution facilities.

Sponge iron plants are categorized under "red categories[3]" industries which mean they have higher pollution potentials and cause serious health hazards. During operation it emits huge quantity of smoke containing oxides of sulphur and carbon, un-born carbon & silica particles. Similarly the processes also release extreme heat. The dust problem becomes aggravate when the ESP is not operated. Due to lack of proper/stringent monitoring mechanism, the plant owners seldom use this instrument thus leading to air pollution.

The origin of pollution in coal based Sponge Iron Plant is as follows:

Table No-7 : Origin of pollution in coal based sponge iron plant

Plant activities	**Principal constituents**	**Manufacturing & operations**	**Likely form of pollution**
Raw material handing • **Iron Ore**	Dust pollution. Oxides of Fe, SiO_2 $Al_2O_{3,\ Sulphur}$, Compounds other trace metals	Stockpiling, crushing, screening & conveying.	Air pollution due to fugitive dust. and Localized noise pollution
• **Coal**	Complex compounds of C, H,N,S, O and minerals.	----------	-------do----
• **Dolomite**	CaO, MgO, C, S & other associated minerals	----------	--------do ----------
Manufacturing Steps Direct reduction of	----------	Reduction temps. – about 1200^0C.	Waste gas generation at around 900^0C

[3] Industries identified by Ministry of Environment & Forests, Government of India as heavily polluting and Covered under Central Action Plan.

iron ore with coal and dolomite as a fluxing agent			containing CO_2 ,CO, SO_2, NOx and particulate • Dust pollution • Thermal pollution • Noise pollution.
Sponge iron product processing	Fe metal 81-84% wt. SiO_2, S,P,C as contaminates.	Separation & screening; ambient temp.	Work environment pollution due to dusts, noise, Non-toxic solid wastes.
Indirect process cooling/direct water spraying.	Industrial water	Process cooling & dust suppression	Generation of waste water with contaminates mostly particulates, thermal pollution of water.

From the above table, it may be noted that the pollution will be primarily due to dust and thermal emissions. Air pollution due to emissions of SO_2 will be significant, where the coal contains high percentage of sulphur. Thermal and NOx pollution of ambient air would occur if not controlled. The industrial activity also requires some manpower to run the plant. So, generation of sanitary wastewater stream is also inevitable. In a sponge iron plant, the followings are the main important areas from where different Environmental pollutants are generated.

1. Raw Material Handling Section (RMHS)
2. Direction Reduction (DR) unit complete with stock house, rotary kilns and cooler.
3. Finished Product-Handling Section (FPHS).
4. Sponge Iron Storage and Loading.

Flue gas emission: The hot flue gas which flows in counter current direction of the materials inside the rotary kiln finally passes through ABC (after burning chamber), where the residue carbon or CO is burned down. The heavier dust particles settles in dust settling chamber and the flue gas containing high quality of fine dust particles are

released in to the atmosphere in form of dense fume through a chimney. If there is no pollution control device installed, it becomes a major source of air pollution.

Fugitive dust: Lot of fugitive dust are generated at various units like crushing & grinding of raw materials such as coal, dolomite & iron ore and movement of these in conveyor line. Pollution controlling equipments like bag filters, water spraying system are used to control the fugitive dust. How ever it has been found that in most of units the bag filters are either punctured or are not changed after its duration period. Similarly due to water scarcity during summer period, the water spraying systems do not function properly.
Major source of fugitive dust in sponge iron plant are coal circuit (crushing and screening of coal), iron ore circuit, conveyor belt, raw material discharge in to storage bins, leakage from slip rings of the rotary kiln, cooler discharge circuit, product separation unit, wind blown dust from solid waste dump yard, transport roads and transport of materials/ solid waste.

Air pollution in Orissa context: State pollution control boar, Orissa has conducted a survey of air quality monitoring in two declared sensitive zones of state such as Kuarmunda & Kalunga . The findings shows that SPM & RPM level in surrounding area exceeded the prescribed standard for residential & rural area. Similar the ambient air quality monitoring made by the regulatory board at Barbil area of Keonjhar district shows that " the SPM & RPM level are higher than the prescribed standard of ambient air for residential and other areas". Similarly the ambient air quality standard is found to be higher than prescribed limit at surrounding areas of sponge iron plant of Angul district. The report mentions that at most of the monitoring site, the ambient air quality standard is found to be higher than the prescribed limit .This scenario is found in almost all area of state. The local people always compliant of high level of air pollution emitted by sponge iron plants. Few industries are found to run ESP (electro static precipitator) and those who runs ESP uses to close it during night times as it generally consumes lot of power . Villagers located surrounding these units always complain of black dust which not only creates problem in respiration, but is creating nuisance. The dress use by local becomes black. The dust settles as a coating on the surrounding vegetation, water body & houses.

Source of water pollution: water demand for sponge iron plants varies between 1.5-2.0 tonne per 1 tonne of sponge iron which is chiefly used for cooling, scrubbing, water sprinkler for dust suppression and for domestic purposes. It has been found out that most of the water used for cooling purpose get evaporated. Domestic effluent generated from plant premises is generally discharged in to near by water bodies. A few plants of state have the option of septic tanks and soak pits. In rainy season, the chances of surface runoff and seepage of rain water from solid waste dump are very high. The water coming from the dump area contains high concentration of Total suspended solids (TSS). Now state pollution control board has made mandatory to construct settling tanks for storage of run off water and prevent the solid to go out of the factory premise. But in orissa scenario, a few are adhering to it. Similarly groundwater extraction is another important issue. Due

Are industries sponging western orissa dry?

All the hullabaloo over diversion of Hirakud water for industrial purpose may have pushed to back-burner, if the real issue "water use by the sponge iron plants in dry western and northern districts where crores of rupees are spent every year on drinking water projects".Instead of addressing the concern of over-exploitation of ground water, the state government seems to have glossed over the magnitude of the problem. According to statistics collected from state pollution control Board, there are 108 sponge iron units in operation in the state and they produce about 33,140 tonne sponge iron daily. A study by board had revealed that a tonne of sponge iron needs water in the range of 4,000 to 6,000 litre.This takes the total amount of water consumed by these units at a staggering 132,560,000 litre (35 million gallon) every day. Capital city Bhubaneswar, on an average needs 15 to 20 million gallons of water a day for consumption. What's interesting, the sponge iron units are concentrated in western parts of the state. An estimate says that at least 70 of these units are in Sundergada, Sambalpur and Jharsuguda where the scarcity of water is high. Since the western districts are a dry region, the sponge iron units do not have may options at their disposal. Use of water is such high volume exerts huge pressure on the existing resources because there is little scope for a alternative, gorund water being the sole source", a senior forest and environment department official said. Sundergada alone has over 45 units with a capaicity of 9500 tonne a day. The western distircts like sambalpur and Jharsuguda have combined capacity of about 9000 tonne. The PCB has been issuring notices to these units over the last several years for violation of water act but these have been of no impact. ***The New Sunday Express, Sunday 14th June 2009***.

to units setting up in cluster, water scarcity has become the major problem in this area. As they can not afford to water brought through tankers or built of small check dams, they are illegally digging bore wells in there campus. Each sponge iron unit has three to five such bore wells in there a premise which has been dug without the permission of water resource department. Water scarcity has become a major problem in area like Bonei, Rajamunda, Kalunga, Kuarmunda due to rapid rate of ground water exploration by these units.

Solid waste management: solid waste disposal has become a major problem in sponge iron plants of state. It has been found out that around 1.6-1.75 tonne of Fe, 1.2- 1.5 tonne of coal & 0.035 tonne of dolomite are required for production of one tonne of sponge iron. This results in production of 0.54 tonne of solid waste which includes 0.25 tonne of dust and 0.29 tonne of coal char. Due to non- availability of good grade of coal , the amount of char fines increases. The size of char varies in size of 0.5 mm to 3 mm thus becomes difficult to handle. Apart from this, it takes a lot of area for disposal. A 100 TPD plants requires 10 acres of land annually for disposal of solid waste. In the absence of land, the industries are dumping this waste nearer to the crop filed, human settlement and in forest. A field visit to Keonjhar districts shows that Orion ispat limited, a sponge iron company located at village Ramchandrapur is dumping its solid waste near to a forest. The dumping side have very small boundary wall. Even dumping of char fines were found near to human settlements. The “Environmental impact study of sponge iron plants in orissa” carried out by state pollution control Board, orissa in its report mentions that non of the 50/100 TPD DRI plants are using char in power generation. The report mentions that a few 300-500 TPD kilns are using char mixed coal as fuel in FBC boilers for generation of captive power plant. Similarly it has been found out that a few industries are using the fine flue dust collected from ESP which can be used as making of bricks . In the absence of substantial practice, a huge quantity of solid waste is deposited in the nearby areas of plant which is creating a lot of public nuisance. Even the plant authority is dumping these wastes near to the vegetation field which is affecting the fertility of crop. During a field visit to Rajamunda, sundergada, it has been found out that all most all the industries located near village Kindrikala are dumping there waste in the

surrounding government lands, forest lands & on village forest lands which is affecting the bovine population. Similar situation is found in places like Kalunga & Kuarmunda. Even the sponge iron units are depositing these waste near to the Rail track. The state pollution control board has admitted that " a few industries have stabilized and reclaimed their solid wastes dumps by this time".

Human health & impact of sponge iron plants: Respiratory related diseases like tuberculosis (TB), asthma, allergy are the disease that are commonly found surrounding the sponge iron plants side. Sponge iron plants also emit oxides of sulphur and nitrogen and hydrocarbons. These air pollutants are likely to increase the incidence of respiratory tract ailments, eg, cough, phlegm, chronic bronchitis and also exacerbate asthmatic conditions. Apart from this, heavy metals released to air from the sponge iron plants are highly toxic. The iron ore contains various type of heavy metal which is released through flue gas. Some of them, eg, chromium (as Cr+6), cadmium, nickel, are human carcinogens. It has been found out that iron acts along with other carcinogenic heavy metals to increase cancer risk. The toxic effects of heavy metals are varied and may often manifest after a prolonged period, sometimes several years, as in the case of cancer.

Heavy metals emitted by sponge iron units:

A preliminary study conducted by Sagar Dhara, an environmental Engineer, in Sukrili block of Mayurbhanj district, Orissa, in 2001 indicated carcinogenic contents in the discharge of Shivshakti Sponge Iron Plant. A movement opposing the plant that was initiated by the local women under the banner of Orissa Nari Samaj gained momentum in the area at the time.

Sagar Dhara, pointing out the environmental hazards of these plants said "Sponge Iron plants release hazardous pollutants like cadmium, nickel, hexa-valent chromium (most dangerous through air and water), arsenic, manganese, and copper. The heavy metals in these particulate matters are most dangerous and can cause quick damage to fruit bearing trees, agricultural harvest and the human body especially the lungs".

Impact on crops: The greatest impact of air pollution on plants occurs close to emission sources. Sulphur dioxide (SO2), nitrogen dioxide (NO2) and particulate matter are primary pollutants, that cause patches on the plant leaf. Plants are known to sustain injury even at relatively low SO2 concentrations. The importance of NOx as a pollutant is primarily because of its participation in photochemical reactions. Coal dust is quite harmful to vegetation, particularly to mango and lemon plants. Due to the synergistic effect of SO2, NOx and fly ash, paddy, mango, chickoo and cashew are generally get affected. The peoples residing at Kuarmunda, Kalunga & Bonai area often complaining of crop loss. The villagers complain that trees like drumstick, papaya are more susceptible to the pollutants. Apart from the villagers are complaining that the grains, vegetables & drinking water turns black, which become unfit for consumption & sell purpose.

Accidents at workplace: The trend in accidental death is increasing rapidly in sponge iron industries of Orissa.. An analysis of the fatal industrial accidents occurred in sponge iron plants in Orissa during last 5 years reveals that maximum of the incident involve burning of body part due to blasting followed by falling from top , run over by heavy instruments & exposure to poisonous gas . This clearly indicates the poor protection measures taken by the companies in their workplace. Use of old machineries, lack of sophistication, improper maintenance, absence of safe operating procedure, lack of awareness, technical knowledge, high production target, employment of non-qualified personnel for the works & over duty are the root causes of such accidents.

Year	Total no. of fatal accidents occurred in sponge iron/steel factories during the year in state.
2000	10
2001	7
2002	16
2003	20
2004	29
2005	18
2006	42
2007	48
2008	55

Almost all the factories in the state are

employing labors on contract basis. It is often observed that the occupier/manager of the factory shift the safety & health responsibility to the contractors. Satisfactory level of safety compliance has become a major concern in these units due to lack of safety officers in factories. Admitting the affected worker in private hospital & nursing home instead of government hospital has become a common trend in order to hide the real fact. **Data of Table No 8** shows that the number of fatal accidents is increasing. In 2007 this number was 48 which increased to 55 in 2008.

Plantation by sponge iron units: The sponge iron industry's green area development record has been abysmal in Orissa. Considering the rate of pollution, there should be a minimum of five rows of trees inside and outside the boundary wall of the unit . But in orissa , not a single unit is not following it. Convince & pressure exerted by government to these units to plant trees has proved unsuccessful, simply because they are not interested.

Action taken by regulatory bodies: During 2004-05 25 number of sponge iron plants were closed down for violation under water (PCP) ,1974 & Air (PCP) 1981 Act. Out of this total closure, maximum closure was found in Sundergada (19number) followed by Jajpur & Jharsuguda (2) each. During the year 2005-06,38 number of sponge iron units were

Seven more sponge iron plants served closure notices: *Bhubaneswar: Exerting pressure further on the companies flouting pollution norms, the State Pollution Control Board (SPCB) has served closure notices on seven sponge iron plants operating in Sambalpur and Jharsuguda districts. With this, 16 sponge iron units have been issued closure notices within a fortnight. Earlier, nine sponge iron plants operating in Sundargarh district faced action. This time, the companies who faced the music, included Viraj Steel and Energy, Samaleswari Ferro Metals, Maa Samaleswri Sponge Iron, Pawansut Sponge, Jai Hanuman Udyog, L N Metallics and Seven Star Steels.Found guilty under Water (PCP) Act 1974 and the AIR (PCP) Act 1981 Act, these companies had been asked to close down their operations and inform the SPCB without delay. SPCB has directed five out of seven companies to stop entire operations while rest two were asked to close down their DRI (Direct Reduced Iron) units. Jai Hanuman Udyog was found dumping solid waster outside factory premise at Raghunathpali in Jharusguda district haphazardly and even after it was given 'reasonable' opportunity, the non-compliance of norms persisted. Same was the case with L N Metallics in Jharusguda. According to closure notice served by Member Secretary of SPCB, the rest five sponge units in Sambalpur and Jharusguda districts have failed to manage their electro static precipitators (ESP) resulting in high emission from the units. The ambient air inside and outside the factories had deteriorated from the prescribed limit. In one case, it was noticed that solid waster was being disposed of in an abandoned quarry close to the Hirakud reservoir posing significant risk of pollution to the reservoir during monsoon. In many cases, closure notices were previously served by SPCB's regional office, but they were ignored by the companies.*
www.hinduonnet.com/2008/04/09/.../2008040955810300.htm

closed for violation of air & water act. Among these closed plants, maximum are located in Sundergada (20), followed by 6 each at Keonjhar & Jharsuguda. During the year 2006-07, 30 number sponge plants were closed for violation of air & water act out of which 15 are located at Sundergada followed by 5 no at Jharsuguda & 4 at Sambalpur. During the year 2007-08, 39 plants were issued closure notice, out of which maximum no were found at sundergada (12), followed by 8 at Keonjhar, 5 at sambalpur & 3 each at Jajpur & Jharsuguda. During 2008-09 (January) 5 number of sponge iron plants were issued closure notice by orissa state pollution control board.

CDM & sponge iron plant: At present, hot waste gas from rotary kiln (about 950 ^{0} ^{c}) is not utilized and disposed into the air. As it is difficult to remove dust from the hot gas by dust separator, dust is also disposed into air. Thus rotary kiln process has the problems from both viewpoints of energy saving and environment

Orissa plans sponge iron cluster at Bonai : With the aim of promoting new technology in the sponge iron plants to reduce carbon emission and ensure optimum use of the resources in the production process, the Orissa government plans to promote a sponge iron cluster at Bonai in Sundergarh district.. About 11 sponge iron units located in about 5 km radius of Bonai are proposed to be covered under the Cluster Development Programme (CDP). Since Orissa considers the sponge iron plants as major feeders units for steel production in the state, improving productivity, reducing emissions and optimisation of resources have turned out to be of paramount importance. Emanated as an initiative of the Green Technology Cell (GTC) of Industrial Promotion and Investment Corporation (Ipicol), the programme aims to reduce the consumption of raw materials like coal and iron ore by the sponge iron plants. It also aims to minimise the pollution by these units to make the production process sustainable.. As part of the Technical Assistance Programme, the United Nations Industrial Development Organisation (UNIDO) will commission a study on Bonai cluster and suggest adoption of new technology to reduce carbon emission.. However, the sponge iron cluster will be formed first after which a diagnostic study for the sponge iron units will be commissioned by UNIDO. Depending on the outcome of the diagnostic study, the model of developing the project will be decided, sources said.. The diagnostic study will make assessment on ways to increase productivity of those sponge iron units located at Bonai and will aim at minimising the level of pollution through use of waste gases and solid waste management. A special purpose vehicle (SPV) will be formed to implement the project. The Bonai Sponge Iron Association may also be roped as partner in the implementation of the project. Sources said, at present, these sponge iron units are producing about 2000 tonne char having low calorific value per day. So the project envisages to utilise the char generated by these sponge iron units to generate about 60Mw to 70 Mw power. It is proposed to link this project with carbon credit under the Clean Development Mechanism (CDM). Further, it also envisages to use pellets in the sponge iron units and increase their efficiency. Each unit will be assessed for increasing the energy efficiency, reduce consumption of water and raw-material. Besides, the possibility of these units having common facilities like coal washery, water storage, R&D and testing facilities will also be explored. http://www.business-standard.com/india/news/orissa-plans-

. However, as most manufactures are small and medium size, they can not afford to invest the effective measures. Under such situation, BPNSI together with OSIMA has decided to modernize such plants. They consist of the installing generator at the exit of the kiln to utilize hot waste gas for generation, and to collect the dust from waste gas. The generated electric power contributes to reduce the purchasing power from the power plant (grid) and the excess amount is sold to grid. As a result, coal consumption for generation in grid may reduce and hence CO2 emission in grid will be reduced.

However, reduction of green house gas by implementation of clean development mechanism is found to be depends upon the sincerity and integrity of the plant owner. Considering the bad track record of the sponge iron units in controlling pollution, it is still doubt ful, if they are practically reducing GHG by implementing various clean process or simply they are using this to get some extra income ?.

Table-9: Name of the sponge iron units that have permitted under CDM.

Project name with location	**Status**	**sector**	**Amount of Energy in MW**	**Technology involved**
Bindal Sponge Limited" , Talcher	Approved	Energy Efficiency	12 MW	WHRB & AFBC
Adhunik Metaliks Limited" , Chadrihariharpur, Sundergada.	Approved		34 MW	WHRB & AFBC
Rathi sponge iron ltd, sambalpur	Approved	Energy Efficiency	12MW	WHRB
Deepak Steels and Power Limited, India" ,Barabil, KEONJHAR	Approved	Energy Efficiency	"10 MW	WHRB
Patnaik Steels and Alloys Ltd, Keonjhar	Approved	Energy Efficiency	8 MW	WHRB
Maheshwary Ispat Limited, Khuntuni, Cuttack	Approved	Energy Efficiency	24 MW	WHRB
Tata Sponge Iron Limited" in Belaipada, P.O- Joda	Approved	Energy Efficiency	18.5MW	WHRB

Rana Sponge Ltd, Orissa, Dhenkanal	Approved	Energy Efficiency	8 MW	WHRB
SHYAM DRI Power Ltd	Approved	Energy efficiency	Not known	WHRB
Hima Ispat Private Limited in Orissa, India" at Barapada – Barbil,	Approved	Energy efficiency	8 MW	WHRB
Bhaskar Steel & Ferro Alloys Ltd. (BSFAL), Rajamunda, sundergada	Approved	Energy efficiency	8MW	WHRB
OSIL, Keonjhar	Approved	Energy efficiency	12 MW	WHRB

Orissa government regulation about location of sponge iron plant :

Government of Orissa, Forest and Environment Dept has stipulated the following regulations for the establishment of sponge iron plants in the state of Orissa.

A. **In six sensitive blocks (**Kuarmunda, Lathikata, Rajgangpur and Bonaigarh block of Sundergarh district, Jharsuguda Block of Jharsuguda District and Rengali block of Sambalpur district) including 25 Km from block boundary –

- No new sponges iron & integrated steel plant will be allowed.
- Cases which had been received by the state pollution control board before the Government decided on a prohibition on establishment of sponge iron plants in the state may be considered individually un merit. These proposals can be considered on case to case basis with the condition that they set up a WHRB with a Power plant within 1 year
- Proposals of establishment of integrated steel plant where MOUs have already been signed with the state government may be considered on merit
- Expansion proposals received by the SPCB before the decision on prohibition on establishment or expansion of sponge iron units was made by the government may be considered on merit within a condition to install WHRB and/or steel plant.
- Expansion of existing plant will be allowed for 25/50 TPD to 100TPD for the purpose of installation of WHRB and power plant.

B. Outside the six sensitive zones

- Cases which had been received by the state pollution control board before the government decision on prohibition to establish sponge iron plant in the state may be considered. These proposals can be considered on case to case basis with the condition for installation of WHRB power plant within 1 year.
- Cases where MOUs have been signed with the State Government may be considered.
- Cases other than the above 2 shall not be considered till an environmental impact study of the existing units as well as proposed units is done and it is examined by the SPCB in consultation with steel and mines and industries department.

- Expansion proposals of existing sponge iron units may be considered to facilitate installation of WHRB with CPP or expansion to integrated steel plant.
- Proposal for integrated steel plants through DRI route may be considered by sSPCB on the basis of merit.

C. **The pending cases** (i.e. Proposals received before the Government's decision on the prohibition on establishment of sponge iron) may be cleared with stipulation of installation of ESP, with separate energy meter, automatic change over to DG set and other pollution control measures as decided earlier or, recommended by the state pollution control board. In addition, explicit stipulation for installation of Waste Heat Recovery Boiler (WHRB) with CPP or upgradation of the unit to steel plant within a period of 1 year from the date of issue of the NOC shall also be made.

D. **The existing sponge iron units** shall be required to install WHRB with CPP within 1 year and take immediate steps for installing equipments for automatic changeover to DG set in case of power breakdown and for installation of separate energy meter as well as other pollution control measures as per the direction of SPCB.

Environmental Standards and Code of Practice for Pollution Prevention for Sponge Iron Plants (Drafted by CPCB)

The proposed standards will be applicable with effect from the date of notification to all new, green field units set up after the date of this notification and all expansion/ modernisation of existing units taken up after the date of the notification. However, the existing units shall install effective pollution control system within six month and shall conform to the standards, after six month of the date of notification.

1.0 Stack Emission Standards

Particulate matter (PM) : 100 mg/Nm^3 (Coal based)
50 mg/Nm^3 (Gas based)

Carbon Monoxide (CO) : Should be 100% combustion

(i) The Kiln off gas stack height should be calculated for proper dispersion of SO_2 (with the formula of $H= 14Q^{0.3}$. Where Q= emission of SO_2 in kg/h) as per emission regulations Part III of CPCB. Sulphur percentage shall be the percentage of sulphur in coal. The stack height in no case should be less than **75 m.** Sampling Portholes and Platforms etc shall be provided as per CPCB regulation.

(ii) Kiln off-gas treatment with efficient dedusting shall be provided. Waste heat utilization for power generation should be followed.

- In the existing plants, provisions of Gas conditioning Tower followed by Pollution Control system for small capacity Kiln (size 100 TPD and below): *
- Entrepreneur having more than 100 TPD kilns shall use WHRB for generation of power.

Adequately designed ESP or Bag Filter or Wet scrubbing system or any other adequate air pollution control system/combination of system should be installed to achieve the prescribed stack emission standards.

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* As it is techno economically not feasible to install WHRB for plants with less than 100 TPD capacity, it is recommended that plants with

less than 100 TPD (total capacity) plant should not be permitted in future.

Program for phasing out old plants having capacity less than 100 TPD may also be worked out.

(iii)The safety cap/emergency stack of rotary kiln type plant, which is generally installed above the After Burner Chamber (ABC) of feed end column should not be used for discharging untreated emission, by passing the air pollution control device.

(iv) Interlocking facility should be provided to ensure stoppage of plant if the pollution control system is not in operation of safety cap of the rotary kiln is bypassing the emissions.

2.0. Stack Emission Standards from de-dusting units

Particulate matter (PM) : 50 mg/Nm^3

All de-dusting units should be connected to a stack having a minimum stack height of 30 m. Sampling porthole and platform etc. shall be provided as per CPCB emission regulation to facilitate stack monitoring.

3.0 Fugitive Emission Standards

The fugitive emissions of suspended particulate matter (SPM) should not exceed 1000 ug/m^3 at a distance of 10 m (approx.) from the sources, identified and mentioned below, where fugitive dust emissions are anticipated. The measurement should be done preferably on 8- hour basis with high volume sampler. However, depending upon the prevalent conditions at the site, the period of measurement can be reduced.

S. No.	Area	Monitoring Location
1.	Raw material handling area	Wagon tippler, Screen area, Transfer Points, Stock Bin area
2.	Crusher area	Crushing plant, vibrating screen, transfer points
3.	Raw material feed area	Feeder area, Mixing area, transfer points
4.	Cooler discharge area	Over size discharge area, Transfer Points
5.	Product processing area	Intermediate stock bin area. Screening plant, Magnetic Separation unit, Transfer Points, Over size discharge area, Product separation area, Bagging area

6.	Other areas	Areas as specified by State Pollution Control Board

4.0 Code of Practice for Pollution Prevention

(i) Raw Material handling and Preparation

a. Unloading of coal by trucks or wagons should be carried out with proper care avoiding dropping of the materials from height. It is advisable to moist the material by sprinkling water while unloading.

b. Crushing and screening operation should be carried out in enclosed area. Centralized de- dusting facility (collection hood and suction arrangements followed by de-dusting unit like bag filter or ESP or equally effective method or wet scrubber and finally discharge of emission through a stack) should be provided to control Fugitive Particulate Matter Emissions. Particulate Matter emission level in the stack should not exceed 50 mg/Nm^3. Water sprinkling arrangement should be provided at raw material heaps and on land around the crushing and screening units.

c. Work area including the roads surrounding the plant shall be metalted / asphalted or concreted.

d. Enclosure should be provided for belt conveyors and transfer points of belt conveyors.

The above enclosures shall be fixed rigid (and not of flexible/ cloth type enclosures) and fitted with self- closing doors and close fitting entrances and exits, where conveyors pass through the enclosures, flexible covers shall be installed at entry and exit of the conveyor to the enclosures, minimizing the gaps around the conveyors.
In wet system, water sprays/ sprinklers shall be provided at the following strategic locations for dust suppression during raw material transfer:

- Belt conveyor discharge/ transfer point
- Crusher/screen discharge locations

(ii) Cooler Discharge and Product Separation Unit

Enclosures shall be provided for belt conveyors and transfer points of belt conveyors. Dust extraction cum control system shall be installed preferably bag filters or ESP to arrest product loss in cooler discharge and product separation area.

(iii) Extensive plantation/Green belt shall be developed along the roads and boundary line of the industry. For plants having capacity upto 100 TPD of production a 15 m width Green Belt along the boundary shall be maintained, while for plants having capacity more than 100 TPD of production a 30 m width Green Belt along the boundary shall be maintained.

(iv) Monitoring of stack emissions, fugitive emissions, trade effluent and noise level shall be done as per CPCB regulations and consent conditions specified by the SPCB.

(v) Pollution control systems shall be operated as an integral part of production to ensure minimum emissions. Pollution Control System shall start before conveyor operation/operation of plant. Similarly pollution control system shall be stopped only after completion of conveyor operation/operation of plant so that possibility of dust settlement in ducts can be eliminated. Continuous evacuation of dust (from Dust catchers, ESPs, Bag filter hopper etc.) shall be organized.

5.0 Effluent Discharge Standards

(a) All efforts should be made to reuse and re-circulate the water and to maintain zero effluent discharge.

(b) Strom water / garland drain should be provided in the plant.

(c) In case of maintenance/ cleaning of the system the settling tanks effluent of wet scrubbing system or re-circulation system is required to be discharged, it should be treated suitably to conform to the following standards.

pH	-Between 5.5 to 9.0
Total Suspended Solids (TSS)	- 100 mg/l
Chemical Oxygen Demand (COD)	- 250 mg/l
Oil and Grease (O&G)	- 10 mg/l

6.0 Noise Levels Standards

	6.00 AM- 10.00 PM	**10.00 PM-6.00 AM**

Noise level (at plant boundary)	**Leq 75 dB (A)**	**Leq 70 dB (A)**

7.0 Solid Waste Management

Char

Char should be mixed with coal or coal washery rejects and used as fuel in Fluidized Bed Combustion Boilers (FBC) for generation of power or sold to local entrepreneurs for making coal briquettes. It can also be mixed with coal fines, converted to briquettes and used in brick kiln. Under no circumstances it should be disposed in agricultural fields/other areas. Logbook for daily record, of Char production and usage must be maintained by industry and the record made available to officials of CPCB/SPCB/PCC during inspection.

Kiln Accretions

The kiln accretions are heavy solid lumps and can be used as sub- base material for road construction or landfill.

Gas Cleaning Plant (GCP)/Scrubber Sludge

The sludge should be compacted and suitably disposed off after ascertaining the composition.

Flue Dust

Flue dust is generated from air pollution control system i.e. ESP or any other air pollution control system installed with kiln. Secondary flue dust is also generated from Bag Filters or any other air pollution control equipment installed with Raw Material Handling, Coal Crusher, Cooler Discharge and product house unit. The reuse/ recycling of the flue dust generated may be explored and suitably implemented.

8.0 Implementation period for existing plants

(i) For plants, does not have any pollution control equipment for kiln off-gas system, shall install pollution control system along with stack of adequate height in all major pollution generating points/sources, within six months of the notification.

Concerned SPCBs will not renew the consent to operate and revoke the consent, in case it is already granted if the industry failed to install pollution control equipment within stipulated time. Legal action as deemed fit should be initiated against such industries.

ii) All Pollution control equipment should be provided with separate electricity meter and totaliser where daily power consumption reading has to be recorded. Non-functioning of Pollution control equipment should also be recorded in the same logbook along with reasons for not running the Pollution Control Equipment.

iii) Char based Power Plant

- For plant having configuration of at least 2x100 TPD kiln or for plants producing more than 200 TPD, Sponge Iron from smaller kilns, power production through FBC boiler using char as a part of fuel, is a viable option. Such plants should therefore plan to produce power for self-consumption.
- Individual Sponge Iron Plants of smaller capacity located in cluster can install a common char based power plant collectively.
- However, for plant having capacity 350 TPD or more, power generation using char as a part of fuel, in FBC Boiler shall be implemented in phased manner within 4 years of commissioning and targeting for 100% utilization of char.

iv) The area for solid waste storage should be separately earmarked for effective management. The various type of solid waste generated should be stored separately in scientific manner so that it should not adversely affect the air quality, becoming air borne by wind or water regime during rainy season by flowing along with the storm water.

New Plant

1. No Sponge Iron Plant will be commissioned without Pollution control system for kiln off-gas treatment as well as de-dusting system for transfer points, day-bins, charging points in Kiln, cooler discharge point, Product processing etc. State Pollution Control Board will accord consent to operate only after Physical verification of the adequacy of the Installed

pollution control systems for meeting the standards and stipulated conditions in the consent to establish.

2. All new kilns shall have independent stack with the kiln or multi-flue stacks in case two or more kilns are joining the same stack for better dispersion of pollutants.

3. Any entrepreneurs having more than 2x100 TPD kilns shall install WHRB for power generation.

For plants having capacity of 350 TPD or more, power generation using char in FBC

Boiler as part of fuel is necessary.

4. Any new sponge iron plant being installed along with other downstream facilities of converting the sponge iron into steel with/without further processing the steel should meet the target of 100% utilization of sensible heat of DR Gas and Char for power generation. Wet scrubbing system for kiln off-gas treatment for such plants should not be opted.

5. Solid waste management program should be prepared with thrust on reuse and recycling. Solid waste disposal site should be earmarked in the plant premises. The storage site of solid waste should be scientifically design keeping in view that the storage of solid waste should not have any adverse impact on the air quality or water regime, in any way.

6. Green belt shall be developed along the boundary line of the plant as well as plantation should be done on internal roads.

9.0 Siting Guideline for Sponge Iron Plants

Siting of new sponge iron plants shall be as per respective State Pollution Control Board guidelines. However the following shall be maintained.

(a) Forest/ Forest land/ ecologically and/or otherwise sensitive areas: A minimum distance of at least 2500 m (2.5 km) to be maintained.

(b) Location of Sponge Iron Plant should be at least 1000 m (1 km) from nearby residential habitation (residential localities/ village).

(c) The location of Sponge Iron Plant should be at least 500 m away from National Highway and State Highway.

(d) Radial distance between two Sponge Iron Plants should be 5 km for plants having capacity 1000 TPD or more. Setting up of smaller Sponge Iron

Plants, less than 1000 TPD may also not be permitted within the radial distance of 5 km from the 1000 TPD plant.

(e) Sponge Iron Plants can be established in notified industrial areas / Estates as notified by State Govt. The criteria a to d may not be applicable in that case.

(f) If any plant/clusters of plants are located less than 1 km from any residential area/ village they should be shifted by State Pollution Control Board/ State Govt. in a phased manner for which time bound action plan is to be prepared by SPCBs.

Conclusion: The environmental problems generated from sponge iron plants have been found quite high in all most all the places of state. The problem is not only confined to air pollution & management of solid waste but it extends to forceful use of CPR such as using common, forest & grazing land , exploration of ground water & creating law and order situation. It has been found that most of the units do not operate pollution control devices for financial gain & those which have installed ESP do not run it properly. The smaller plants eve do not have competent technical man power to properly manage the pollution control system & the pollution level in all the clusters has gone beyond the saturation point. The situation is becoming worse in district like Angul, where more number of thermal power plants are in pipeline although the ambient pollution level created by sponge units has exceed all the limits. Although state pollution control board has issued closure notices to a number of units, but it hardly affects there operational activity. There is an urgent need of installation of IT based interlocking system in each sponge iron units of state in order to ensure the check of pollution, other wise it will be too late. Apart from this, time has come for strict action to be taken by regulatory authority to check pollution. The regulatory authority should ensure that the units should strictly comply with all the pollution monitoring norms before revoking the closure notice, other wise the traditional way of issuing notice & withdrawing will have no impact.

Reference:

1- Environmental impact study of sponge iron plants in Orissa, prepaired by state pollution control Board.

2- Pradhan P.C, 2003. Hand book of sponge iron.

3- Report of the Sub-Committee for Supreme court monitoring committee on Hazardous waste, Orissa.

4- Coal based sponge iron industry. A prime mover to enhance steel making capacities in India by Ashok pandit, B.M.Sarangi, A.Keshava Babu & M.K. sheshadri.

5- Risk appraisal study: Sponge iron plants, Raigarh District prepaired by sagar Dhara, Cerena foundation.

6- www.ospcboard.org

7- Information obtained under RTI act, 2005 from Orissa state pollution control board.