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# Golden Research Thoughts

**GRT**

## “SPONGE IRON INDUSTRY IN CHHATTISGARH: PROBLEMS AND PROSPECTS”

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### ABSTRACT

India is the largest producer of Sponge Iron since 2003. In 2014, global Sponge Iron production was 74.55 million tons with India contributing 23% of it (17.31 million tons). India continues to remain at the top position since 2003 despite the shortages of iron-ore, coal and natural gas. Sponge Iron industry is very important in secondary steel segment. Steel industry contributes nearly 2% to GDP of India and employs more than 6 lakh people. Ministry of Steel has set target of 300 million tonnes production capacity by 2025. Sponge Iron Industry will play an important role in order to achieve this ambitious target. Chhattisgarh is the largest producer contributing almost 26% of India's DRI (Direct Reduced Iron) production. The

demand for steel is expected to grow by 10% and therefore the demand for sponge iron will also increase in future.

**KEYWORDS** :Sponge Iron, Coal, Iron-Ore, Steel, Reduction.

### INTRODUCTION

Sponge Iron is the product obtained by direct reduction of iron-oxide by using non-coking coal or natural gas as a reductant. Iron ore always exist in the form of oxides. During the reduction process the oxygen gets removed, leaving behind the incoherent and spongy mass called as Sponge Iron. It is

also known as DRI (Direct Reduced Iron). The sponge iron thus obtained is rich in iron (80-90%), has balanced carbon content, and lower sulphur and phosphorus contents. This makes it ideal input for steel making.

Different routes of steel making are Blast furnace (BF), Electric Arc Furnace (EAF) and Induction Furnace (IF). Steel Scrap and Coking Coal are used as raw materials in Blast Furnace for steel production. With the rising price of steel scrap and coking coal, the alternative route of steel making through Electric Arc Furnace (EAF) and Induction Furnace (IF) is increasing globally. Sponge Iron is used as a substitute of scrap in EAF/IF. However, the basic raw materials required for Sponge Iron production are Iron-ore, Non-coking Coal/Natural Gas and Dolomite (or limestone). Countries like India with limited availability of natural gas mostly use coal as a reductant. Therefore almost 80-90% of India's DRI production is through coal based process and remaining through gas based process.

### **OBJECTIVES OF THE STUDY**

Sponge Iron is very important input for Steel Industry. It is one of the key raw materials in steel production. The present study is undertaken with the following objectives:

- + To Study the importance of Sponge Iron to Steel Industry.
- + To study the problems faced by Sponge Iron Industry in Chhattisgarh
- + To analyze the current scenario and future prospects of sponge Iron Industry in Chhattisgarh especially in Raipur.

### **HYPOTHESIS**

- + Future prospects of Sponge Iron Industry in Chhattisgarh are very good.
- + Easy availability of Raw Materials is essential for growth of Sponge Iron Industry.

### **RESEARCH METHODOLOGY**

The proposed research work is entirely based on secondary data. The data was collected from books, journals, magazines, websites and annual report of Ministry of Steel of 2015-16 and Economic Survey 2015-16 of Chhattisgarh Government.

### **OVERVIEW OF SPONGE IRON INDUSTRY**

The global production of Direct Reduced Iron in 2003 was only 49.45 MT which has steadily increased to 74.55 MT in 2014. India is the largest producer of Sponge Iron since 2003 with production growing from 7.67 MT in 2003 to 17.31 MT in 2014 accounting for 23% of world's production. After the first Sponge Iron Plant set up in Paloncha in Andhra Pradesh in 1980, the Government restrictions prevented the growth of Sponge Iron Industry. Realizing the importance of steel and increasing imports of steel scrap, the Sponge Iron Industry was de-licensed in 1985 well before liberalization of economy in 1991. Soon after this the number of DRI units increased rapidly. At present there are 446 Coal based Sponge Iron units and 3 gas based units. Odisha (110) has the highest number of units followed by Chhattisgarh (85) units and West Bengal (65). Today these states have become major contributors to country's Sponge Iron and Finished Steel production. Chhattisgarh is the largest producer contributing 26% to country's Sponge Iron and nearly 30% of steel production. Major steel producers like SAIL, Jindal Steel and Power limited, Monnet Ispat and Energy limited, Godawari Power & Ispat limited and have their plants in the state. The table below shows the sponge iron production in india in the last five years:

TABLE 1. SPONGE IRON PRODUCTION IN INDIA (IN MILLION TONNES)

Reductant Used	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Coal</b>	19.27	19.80	19.07	20.19	21.89
<b>Gas</b>	6.07	5.17	3.94	2.68	2.35
<b>Total</b>	<b>25.34</b>	<b>24.97</b>	<b>23.01</b>	<b>22.87</b>	<b>24.24</b>
<b>Coal based %</b>	<b>76%</b>	<b>79%</b>	<b>83%</b>	<b>88%</b>	<b>90%</b>

Source: Annual Report Ministry of Steel 2015-16

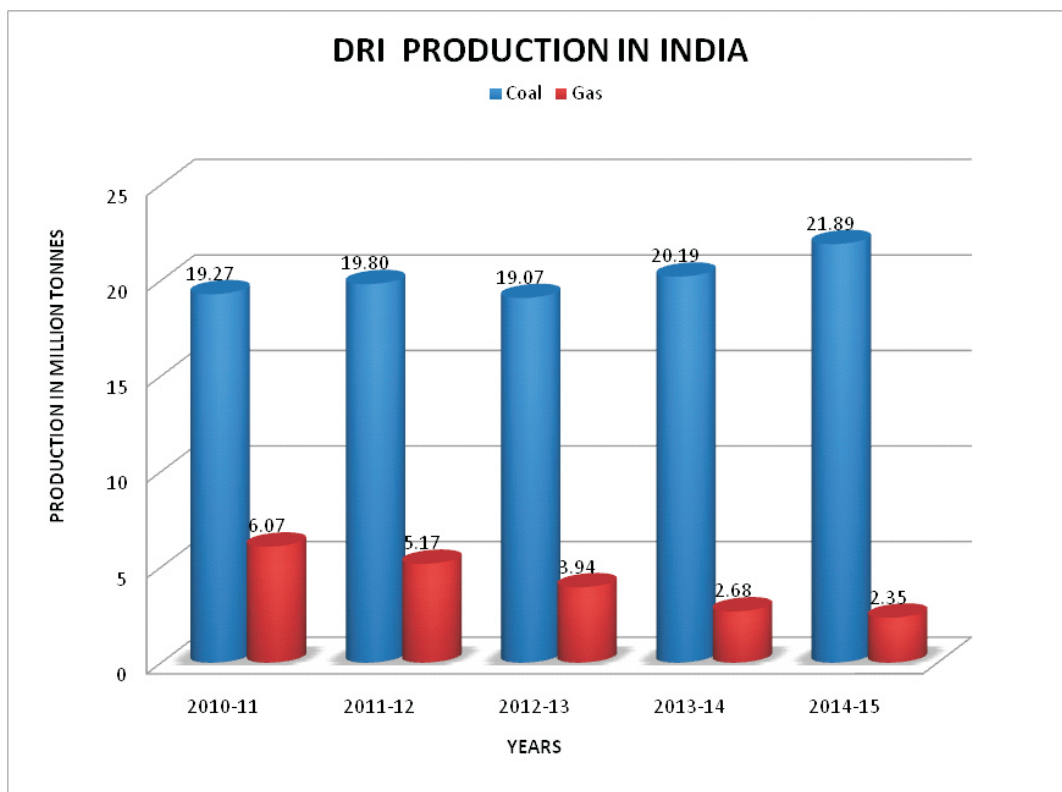


Figure 1: Graphical Presentation showing DRI production in India in last five years

Though the sponge iron production has been constant with some minor fluctuations but the contribution of coal based process to overall production has gradually increased from 76% to 90% in the last year. This is because of easy availability of iron ore, non-coking coal whereas gas is available only in limited quantity. Coal based units require less investment and are easy to expand as compared to gas based units. All the Sponge Iron plants in Chhattisgarh are Coal based. Coal based process use rotary kiln or rotary hearth as reactors. Different coal based processes using rotary kilns are like SL/RN, Krupp-Codir, ACCAR, DRC, and some customized processes are JINDAL, TDR and Poppuri Engineering. All the plants in Chhattisgarh use rotary kiln for direct reduction and most of them follow SL/RN method. Maximum plants are in Raipur (46) and Raigarh (19) district with some plants in Janjgir-Champa,

Bilaspur and Durg district.

### **Problems of Sponge Iron Industry**

Sponge Iron Industry is going through a challenging phase. On one side it is reeling under pressure due to short supply of raw materials, cheap imports of steel scrap, dumping of steel etc. and on the other hand the demand for steel is expected to grow in coming years. This in turn will increase the demand for sponge Iron. The major problems of Sponge Iron Industry identified were as follows:

- + There is always a shortage of key raw materials like iron-ore and non-coking coal. Due to this irregular supply of raw materials, many sponge iron units have either shut down or scaled down their operations.
- + NMDC is the major supplier of iron ore in Chhattisgarh but inconsistency in quantity and quality create problems. NMDC focuses on export of iron-ore at high prices rather than domestic supply. This forces the manufacturer to import or buy iron ore from the open market resulting in increased cost of production.
- + Sometimes the iron ore available is not as per specification forcing the Sponge Iron units to use pellets instead of lumps of iron-ore. This also increases the cost of production and decreases the profit.
- + Non-coking coal is also not available as per the quantity and quality desired. Demand for coal is about 30 MTPA but Coal India Limited (CIL) is able to supply only 7-8 MTPA. Rest of the demand is fulfilled through import, purchase from open market and through e-auctions. This also adds to the cost of Sponge Iron.
- + Cancellation of Coal blocks by the honorable Supreme Court has also added to the woes of Sponge Iron Industry. Many Sponge Iron units have lost their captive mines.
- + Chhattisgarh being landlocked state import of coal is not direct. It is always done through ports which involves additional transportation cost from port to plant enhancing the cost of production.
- + Lack of Rail and road infrastructure also delays the transportation of raw material from mines to plants.
- + Sponge Iron is used as a substitute of scrap. Steel scrap is a discarded product therefore its price adjusts according to market forces of demand and supply. But Sponge Iron being a manufactured product, its price cannot fall below a level. Import of cheap steel scrap from China, Korea and Russia has also forced the manufacturers to decrease their margins.
- + Slow down in China has negative impact on demand of steel and consequently on sponge Iron Industry.
- + Large plants use the waste gases and char for power generation in Waste Heat Recovery Boiler whereas small plants lack such captive power generation facilities. This makes the large plants more energy efficient and eco-friendly.
- + Due to lack of skilled man power, major part of operations rests in the hands of semi-skilled or unskilled labour leading to inefficient operations.

### **FUTURE PROSPECTS OF SPONGE IRON INDUSTRY**

Despite the sluggish demand, the future of Sponge Iron Industry in Chhattisgarh is very bright. Most of the plants are working at 80-90% of their capacity. DRI is used as raw material for manufacturing different steel products. So the future of Sponge Iron Industry very much depends upon the future of steel industry. The future prospects of Sponge Iron Industry are revealed through following points:

1. India was the third largest producer of steel in 2014-15 with China and Japan at 1st and 2nd position respectively. World production of steel was 1622.8 million tonnes of which India accounted for 89.60 million tonnes (5.5%) an increase of 2.6% as compared to previous year. China the largest producer of steel contributes nearly 50% to world’s production whereas India contributes just 5.5% to world’s production. So there is lot of scope for growth in production.
2. Per capita consumption of steel in World is 216 kg, in China 510 kg whereas in India it is only 59 kg way behind the consumption by other Asian and European countries. So there is lot of potential for growth in demand of steel in India especially in rural areas.
3. According to the survey conducted by Ministry of Steel through Joint Plant Committee to assess the demand for steel in rural India for period 2016-17, 2019-20 the average per capita consumption of steel was assessed at 9.78 kg during 2007-09. It is estimated to increase to 12 kg in 2020 based on increased consumption of steel products. This translates into at-least 20% growth in demand of steel. It will be mainly driven by construction activities, purchase of automobiles, furniture, utensils and other items. This will in turn increase demand for DRI.
4. The table below shows the trends in production for sales, consumption, import and export of total finished steel in India from 2010-11 to 2014-15. The table clearly shows that there is rising trend in production and consumption of steel. The deficit in demand and supply is fulfilled by imports from foreign countries.

**TABLE 2**

Item Total Finished Steel	2010-11	2011-12	2012-13	2013-14	2014-15	% Change
<b>Production for Sale</b>	68.62	75.70	81.68	87.67	92.16	5.12%
Real Consumption	66.42	71.02	73.48	74.09	76.99	3.91%
Import	6.66	6.86	7.93	5.45	9.32	71%
Export	3.64	4.59	5.37	5.98	5.59	- 6.5%

Source: Annual Report 2015-16, Ministry of Steel

5. The production of finished steel for sale is increasing every year. In the year 2010-11 the production was 68.42 MT whereas in 2014-15 it was 92.16 MT with average annual growth of 8.7%. It is further expected to increase to 100 MT in the year 2015-16. Chhattisgarh with its rich mineral reserves has become the hub of iron and steel industry and will play the key role for its growth.

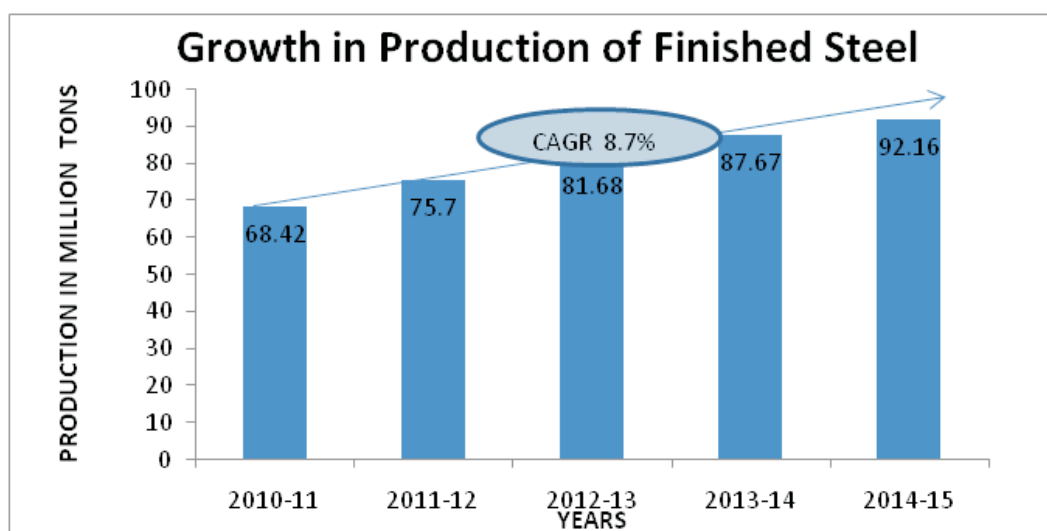


Figure 2 Growth in Production of Finished Steel during last five years

6. DRI is used in Electric Arc Furnace (EAF) or induction Furnace for steel production. This method of steel making through alternative route is increasing and so the demand for DRI.

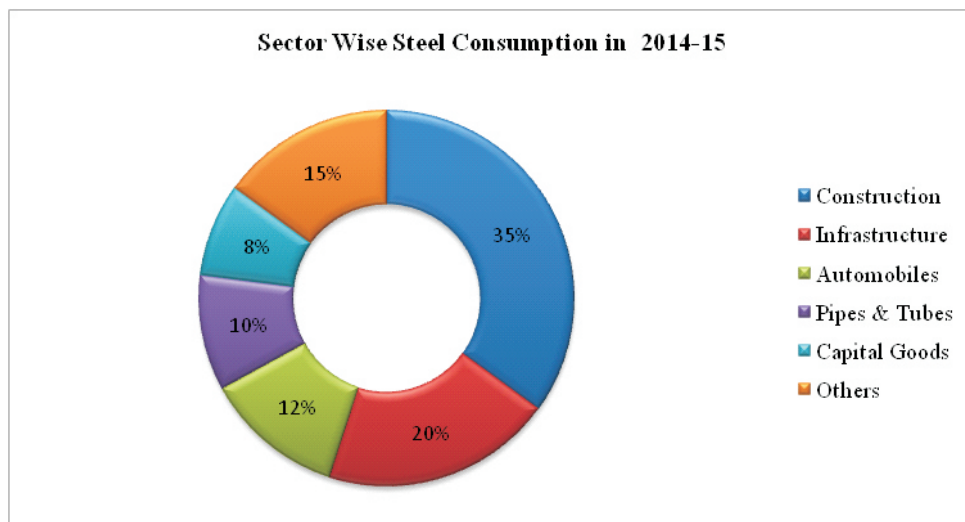
TABLE 3

PROCESS ROUTE	Percentage Share(%)				
	2010-11	2011-12	2012-13	2013-14	2014-15
<b>Basic Oxygen Furnace(BOF)</b>	43	42	42	43	42
<b>Electric Arc Furnace(EAF)</b>	24	25	25	23	26
<b>Induction Furnace (IF)</b>	33	33	33	34	32
Total	100	100	100	100	100

Source: JPC

7. Ever increasing demand of steel in different sectors also contributes to the growth of steel leading to growth of DRI. Construction activities account for largest consumption of steel (25%) followed by infrastructure (20%) and automobile (12%) in 2014-15. These sectors are expected to follow the same trend in coming years.





**Figure 3: Steel Consumption in Different Sectors in 2014-15, Source: Ernst & Young**

8. DRI is used to manufacture different steel products like steel pipes, steel springs, steel billets, steel forgings, steel reinforcing bars, steel angles etc. making it essential input for steel industry. The demand of all above products is likely to increase and therefore the demand for DRI will also increase.

9. The highest amount of allocation of 2.21 lakh crores was made to infrastructure sector in union budget 2015-16. Out of above amount 69,000 crores for capitalization of Indian railways which will translate into higher demand for steel and DRI as well.

10. Four MoUs have been signed by Govt. of Chhattisgarh in the presence of Honorable Prime Minister, Hon'ble Minister of Mines and Chief Minister of Chhattisgarh with different organizations in the year 2014-15 evident of growing demand and expansion plans:

- a. MoU between Govt. of Chhattisgarh, NMDC, IRCON, and SAIL for 140 km rail line between Rowghat and Jagdalpur investment costing Rs. 2,000 crores.
- b. MoU between Govt. of Chhattisgarh, NMDC, and SAIL for 3 million ton steel plant with investment of Rs. 18,000 crores
- c. MoU between Govt. of Chhattisgarh and NMDC for slurry Pipeline and 2 MTPA Pellet plant at Nagarnar in Bastar with investment of Rs. 4,000 crores.
- d. MoU between Govt. of Chhattisgarh and SAIL for setting up 1MTPA plant at Dalli-Rajhara, Balod District with an investment of Rs. 826 crores.

11. The State Government has proposed huge expenditure in budget 2016-17 in infrastructure and social welfare sector. Govt. has proposed construction of bridges, renovation of airports, extension of railway lines, construction work of Bastar and Sarguja University, sports complexes, 8 new ITIs, construction of toilets etc. These public expenditures will translate into increased demand for steel and ultimately for sponge iron.

12. Chhattisgarh has country's 17.42% of coal reserves, 18.67% of iron ore reserves, 37.69% of Tin-ore, 11.24% of Dolomite, 5.15% of Limestone and 5% reserves of Bauxite. The state ranks third in Coal, Iron-ore and Dolomite reserves, Fourth in Bauxite and fifth in Limestone reserves. These minerals are

important raw materials for Sponge Iron industry

## CONCLUSION

With increasing construction activities and Government's thrust on infrastructure spending, the demand for steel and sponge iron will continue to grow. A massive US\$ 1 trillion expenditure on infrastructure is expected by Niti Aayog in 12th Five Year Plan will also boost the demand of steel. However proper steps should be taken to solve the problems confronted by sponge iron industry. Government should also ensure the supply of key raw materials and promote the establishment of large plants with captive power generation facilities. Research & Development activities in the industry should also be encouraged. Future growth and sustainability of Sponge Iron industry lies in adapting modern technologies, efficient operations, cost reduction and compliance with environment norms.

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