STEEL MAKING:
DRI ROUTE - VIABLE OPTION

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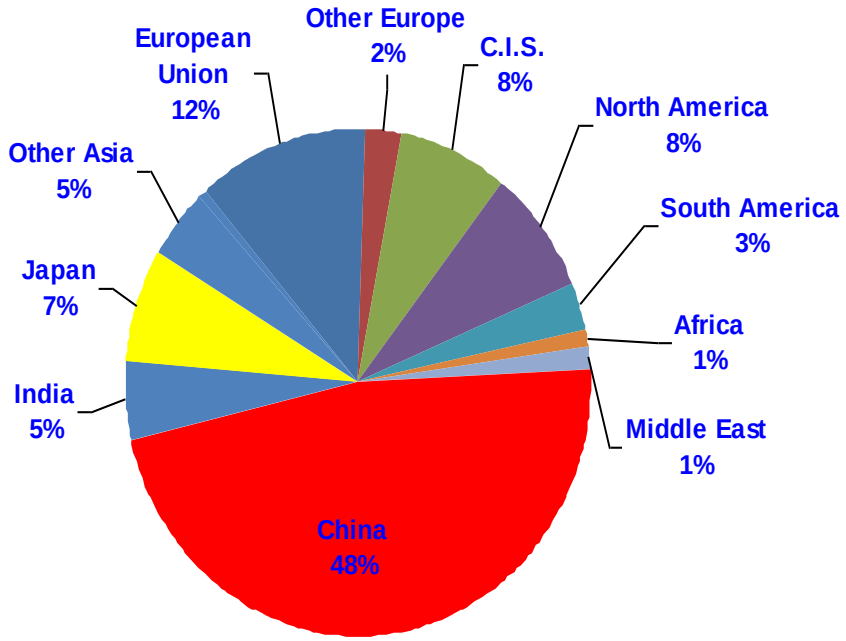
GLOBAL STEEL SCENARIO

World Crude Steel Production 2011 :

1490 Million MT



Country	Rank	Production in Mill. MT
China	1	684.28
Japan	2	107.59
United States	3	86.25
India	4	72.21
South Korea	5	68.47
Russia	6	68.74
Turkey	7	34.1
Germany	8	44.29
Ukraine	9	35.33
Brazil	10	35.16

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Source: WSA

INDIAN STEEL INDUSTRY

INDIA-AN ATTRACTIVE DESTINATION FOR STEEL HUB

- 25 billion tonnes of iron ore reserves - 5th largest reserve base in the world.
- 267 billion tonnes coal reserves (106 BT proven)- 4th largest in the world.
- The Iron and Steel Industry :
  - Around 2 % of the Gross Domestic Product (GDP)
  - Around 6.2%- its weight in IIP.
  - Around 3.64 %- its weight in WPI
- Current Domestic steel consumption was at 65.6 Mn. Mt increased by 10.6 per cent, likely to maintain its growth momentum.
- India –The 5th largest producer of crude steel in the world and is expected to become the 2nd largest by 2015-16.

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INDIAN STEEL

PERFORMANCE TREND

Total finished steel (alloy + non-alloy) ('Mn Tonne)

Year	Production for sale	Import	Export	Consumption
2008-09	57	5.8	4.4	52.3
2009-10	60	7.3	3.2	57.7
2010-11	66	6.8	3.5	66.0

Steel use per capita (Kgs.)

	2007	2008	2009	2010
South Korea	1,144	1,211	936	1,077
Japan	637	612	416	503
Germany	518	514	343	441
China	320	327	409	427
Unites State	359	324	193	258
World	199	194	181	203
India	46	45	48	52

In India, per capita steel consumption in urban areas was 145 Kg, rural areas-only 3 Kg (2008-09).

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Projected Crude Steel Capacity For Terminal Year of the 12th Plan

Producers	2010-11	2016-17 #
SAIL	12.84	20.75
RINL	3.6	7
TATA Steel	6.8	16
Essar Group	8.5	10
JSW	7.8	15
JSPL	2.4	11.5
Ispat Industry	3.3	5.63
Bhushan Steel Ltd.	1.5	5.2
Monnet Ispat & Energy Ltd	0.3	4.9
Others (including Small Scale IF/ EAF units)	31	55
Total	78.04	150.98

Estimation by Working Group in Steel Ministry

 # Projected

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Integrated Steel Plants in India	
Plant	**Process Route**
SAIL, Bhillai	BF-BOF/THF
SAIL, Durgapur	BF-BOF
SAIL,Rourkela	BF-BOF
SAIL, Bokaro	BF-BOF
SAIL, Burnpur	BF-THF
RINL, Vizag	BF-BOF
TATA Steel, Jamshedpur	BF-BOF
JSW, Bellary	COREX/BF-BOF
Essar Hazira	HBI-EAF
Ispat Dolvi	DRI/BF-EAF
JSPL, Raigarh	DRI/BF-EAF
BPSL, Angul, Dhenkenal	DRI/BF-EAF
MIEL, Raigarh, Angul, Jhk	DRI/BF-EAF

TECHNOLOGY IN USE IN INDIA FOR CRUDE STEEL PRODUCTION

Indian Crude Steel production by Process Route (Percentage Share)			
Process Route	2005-06	2009-10	2010-11
Basic Oxygen Furnace (BOF)	53%	45%	44%
Electric Arc Furnace (EAF)	18%	24%	24%
Induction furnace (IF)	29%	31%	32%
Total	100%	100%	100%

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KEY CHALLENGES

- Limited reserves of coking coal, resulting in unpredictable prices.
- Low iron ore fines usage.
- Difficult availability and high cost of scrap.
- Iron ore mining still remains unregulated.
- Rising cost of input materials-resulting in lower growth in production
- Environmental Issues.

With growing scarcity of scrap and coking coal, a replacement could be found in the form of DRI, produced from iron ore with reformed natural gas/ non-coking coal as reductant.

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Need to develop the domestic resource fully

- **Coal demand is projected to increase 4 fold in next 20 years.**
- **Sponge Iron Industry alone will be requiring about 43 Million tonne by 2013-14**
- **International coal & energy markets are volatile in nature.**
- **Imports of coal are fraught with available port capacity and inland evacuation issues.**
- **With rising coal price & freight charges, operation could become un competitive.**
- **Captive policy if adopted by the foreign countries, can change the scenario.**

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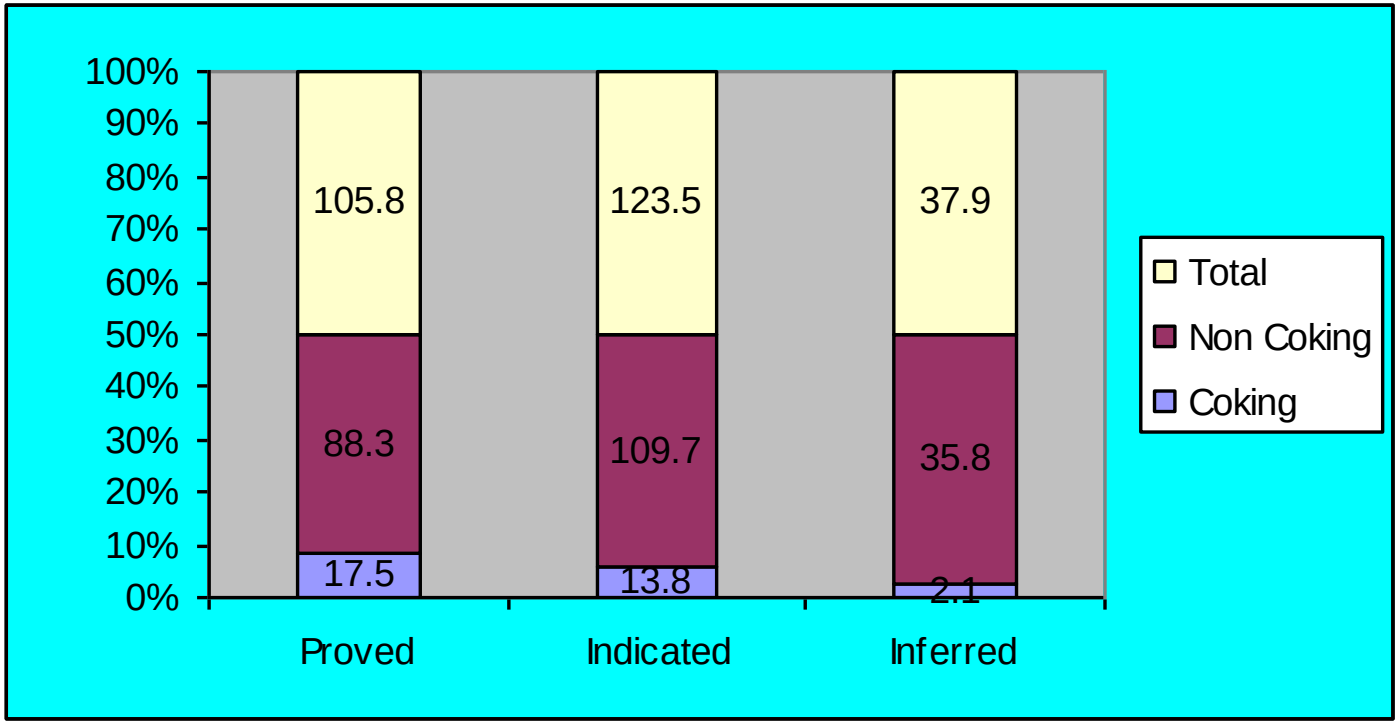
COAL RESERVES IN INDIA

Fig in Billion Tonne



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DRI : A nerve for steelmaking

- 1/3 of total steel is by DRI route.
- Worldwide paradigm shift from BF/BOF route to EAF/IF for environmental reasons.
- Played the role of catalyst - in Steel Industry Growth in recent years by providing big impetus to Secondary Sector.
- Technological improvements favor enhanced usage of sponge iron in all the routes of steel making on economic and environmental grounds.
- Substantial Value-Addition.
- Relative low cost of investment.
- Ease of setting up of a sponge iron plant.
- Clear-cut technology of direct reduction.

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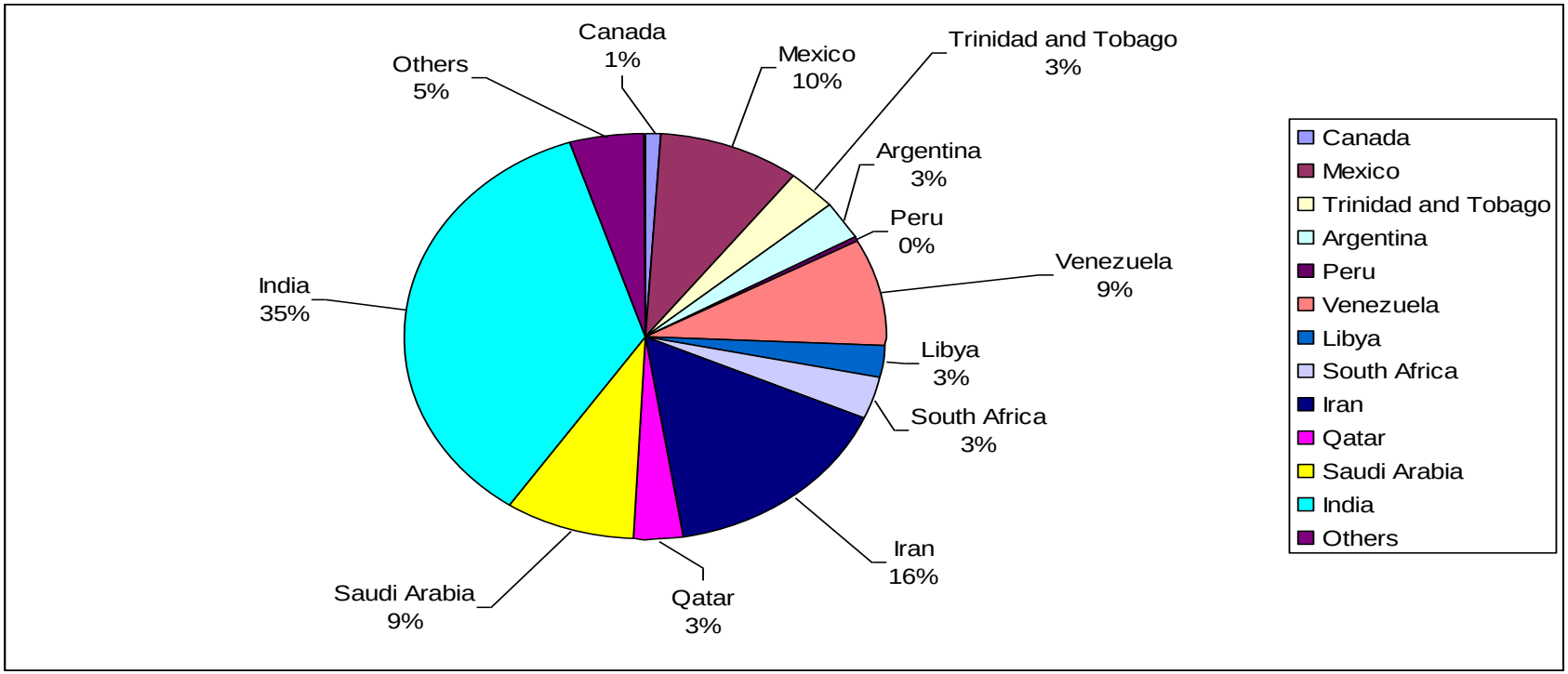
SPONGE IRON PRODUCTION- WORLDWIDE



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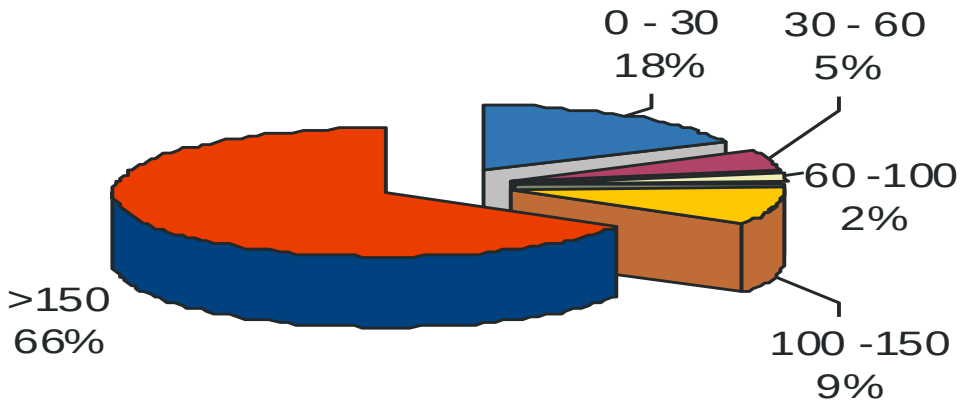
Sponge Iron Industry Structure: India

- More than 350 units with total Installed capacity 2010-11 is 34.94MT.
- Capacity utilization: about 64-67%.
- 70 large & medium producers account for over 75% production.
- Units mostly clustered around raw material belt.
- No existing plan for setting up new gas based capacity at present.
- Almost 60% of Sponge Iron volume produced is used for captive consumption.

Capacity Distribution

000 Ton per Annum



Source : SIMA

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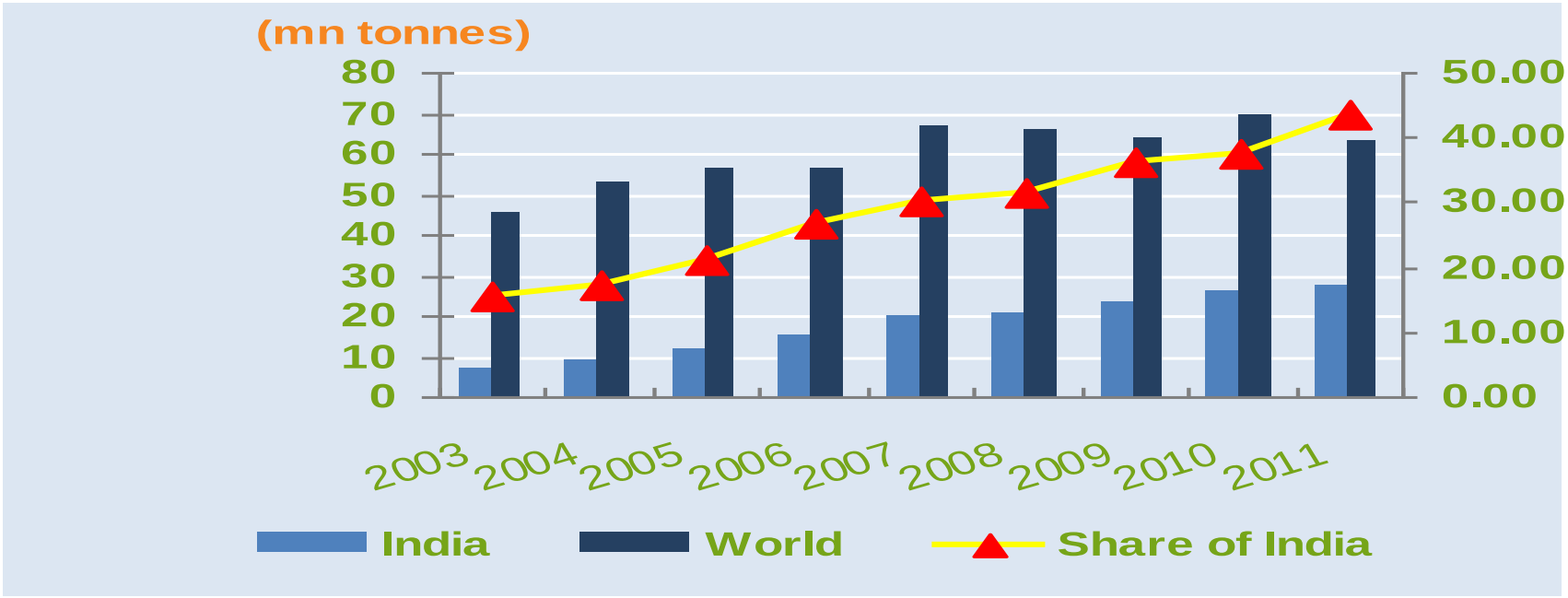
DRI PRODUCTION : GLOBAL Vs INDIA



Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
India	7.1	9.1	12.1	15	20.1	20.9	23.4	26.3	27.6
World	45.9	53.4	56.7	56.4	66.8	66.1	64.5	69.9	63.5
Share of India	15.38%	17.07%	21.26%	26.66%	30.12%	31.65%	36.36%	37.60%	43.42%

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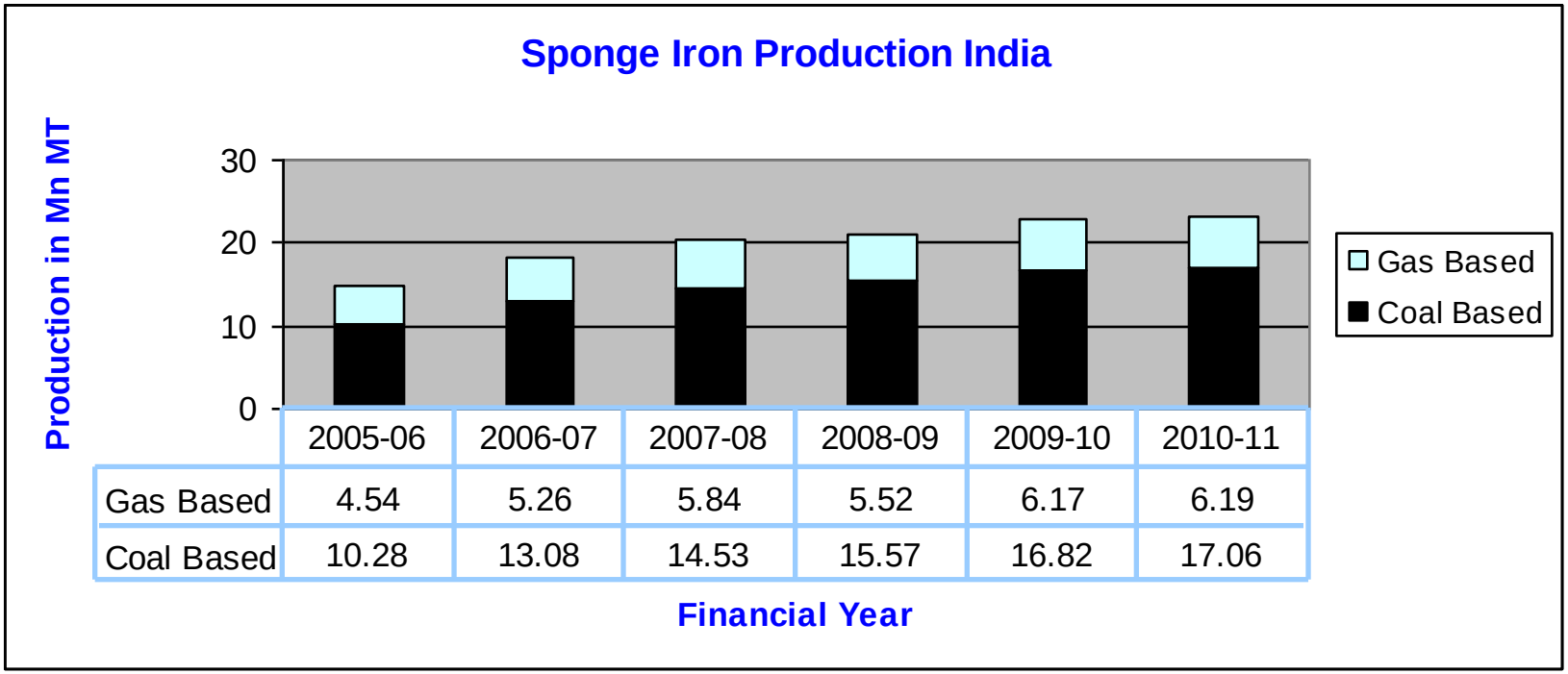
Source : WSA

Gas Based Vs Coal Based Production of DRI in India

- India, the world's largest producer of sponge iron 23 MMT, expected to maintain its lead in the near future.
- Sponge iron production grew at a CAGR of 11 per cent to reach a level of 21.09 million tonne in 2008-09 compared to 12.54 million tonne in 2004-05.
- In spite of slow down Sponge Iron Industry has shown 7.8% growth in production for FY 2009-10.



	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Gas Based	4.54	5.26	5.84	5.52	6.17	6.19
Coal Based	10.28	13.08	14.53	15.57	16.82	17.06

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Sponge Iron ecology provides employment to over 1.5 lakh workers and generates INR 40,000 cr of revenue across the value chain …

No.	Particulars	Benefit (2010)
1	**Generation of Employment**	**Over 1.50 lakh**
1.1	Direct employment	Over 90 thousand
1.2	Indirect employment	Over 60 thousand
2	**Payment of Wages to the Sponge Iron Plant Workers**	INR 2000 to 3000 cr
3	**Revenue Earnings towards - Government**	
3.1	Excise duty @ 4%	INR 1600 to 1700 cr
3.2	VAT @ 10.3%	INR 4000 to 4200 cr
4	**Value of the Sponge Iron produced**	INR 40,000 to 42000 cr

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Source: EY Analysis, Discussion with SIMA

The Advantages of Sponge Iron Use

- With growing scarcity of scrap, a replacement could be found in the form of DRI .
- Sponge iron uses non-coking coal, and iron ore fines - palletized form or directly.
- Compared to scrap , DRI is more consistent in composition, low trace elements and environment friendly while in use as metallic charge.
- Low levels of residuals/tramp elements.
- Lower Sulphur & Phosphorus content: Maintenance of sulphur in steel by its removal in sponge manufacture.
- Low content of dissolved gases.
- Uniform size and higher bulk density as compared to scrap.

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The Advantages of Sponge Iron Use

- Possibility of producing variety of steels.
- High Fe Content and high degree of metallisation.
- Capability of forming protective cover of foamy slag in the bath.
- Lower refining requirements of steel produced.
- Potential of sensible heat recovery from waste gases.
- Minimum dust generation during handling.
- Average IF furnaces uses 60 % sponge iron as metallics
- Good flow ability in bins and conveyors for continuous and trouble free charging.
- Superior Technical Support to Furnace operators.

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MIEL- DOING ITS BIT IN DRI PRODUCTION GROWTH

- 2nd Largest Coal based Sponge Iron Manufacture
- Forward integration by setting up its integrated steel manufacturing facility of 1.5 Mn Tonne at Raigarh.
- Upon completion (March'11) , through BF/DRI-EAF route will add high-quality long and flat steel :

Plate	: 6,00,000 tonne p.a
HR Coil	: 2,50,000 tonne p.a
QST Rebars	: 5,00,000 tonne p.a
Blooms & Rounds	: 1,50,000 tonne p.a

New capacity addition	: 1.5 Mn. Mt (Orissa),
(On cards)	: 1.5 Mn.Mt (Jhk)

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Conclusion

- **More R&D is required to facilitate commercial use of new technologies like Finmat and Fastmat.**
- **Invent of coal Gasification Technology to increase the minimum economy of scale.**
- **PSU as well as Private Entrepreneur must be encouraged for setting up plants for beneficiation and palletizing and sintering of Iron Ore fines.**
- **Export of high grade iron ore must be banned, and export duty on other grade should be raised.**
- **The Import duty of Iron ore pellets should be made NIL.**
- **Linkage should be made available in fully to meet the immediate requirement of raw material to the companies has already been allocated the coal block but not able to start the mining due to a genuine reason.**
- **Use full B & C grade coal should be reserved for sponge iron only.**
- **Steel Industry in India can survive- if it is globally competitive in terms of costs and quality, which can only happen if the challenges are suitably addressed**

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THANK YOU

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