# Benchmarking for Enhancing Competitiveness of Indian Steel Plants

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# Presentation Flow

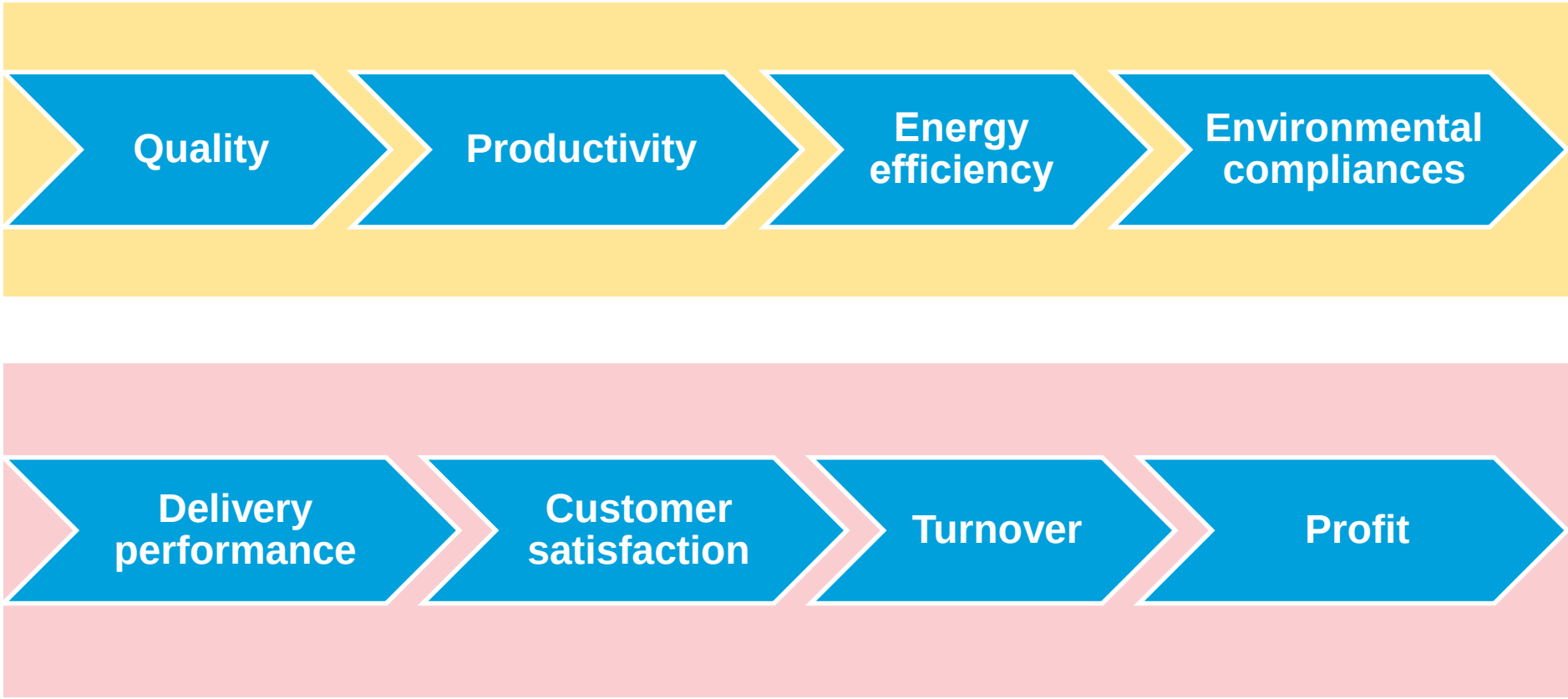
- Introduction – Need for benchmarking
- Global Benchmark for Iron & Steel Industry
- Benchmarking – JSW Steel vs Indian Steel Plants
- JSW Initiatives
- JSW Roadmap

# Why Benchmarking?

**“What you don’t measure, you can’t manage.”**

- Helps in establishing a standard for comparison.
- Helps enterprises to identify inefficiencies and search for more efficient technology / opportunities.
- Improve the understanding of a process and help identify best practices.
- It improves the skill, knowledge and efficiency of the people
- Increased attention for energy-efficiency and performance.
- Benchmarking  essentially is a measuring Tool and helps in continual improvements.

# What Benchmarking influence ?



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# Global Benchmark for Iron & Steel Industry

| # | Parameters | Units | Global Average | India Average |
|---|---|---|---|---|
| 1 | Greenhouse gas ($CO_2$) emissions | Tons $CO_2$ / TCS | 1.90 | 2.60 |
| 2 | Specific Energy Consumption | GCal / TCS | 4.85 | 6.25 |
| 3 | Water pollutant discharge | Kg / TCS | Zero | 0.10 |
| 4 | Blast furnace productivity | T / $m^3$/ day | 3.0 | 2.3 |
| 5 | Blast Furnace campaign life | Years | 20 | < 15 |
| 6 | BOF lining life | No. of Heats | 12500 | 6000 |
| 7 | BOF/EAF slag utilisation | % | 75 | 30-50 |
| 8 | R&D Expenditure/Turnover | % | 1.50 | 0.20 |

**Ref : worldsteel.org and un.org/sustainable development - 2015,**
***Operating committee meeting on Sinter & BF – 2016***

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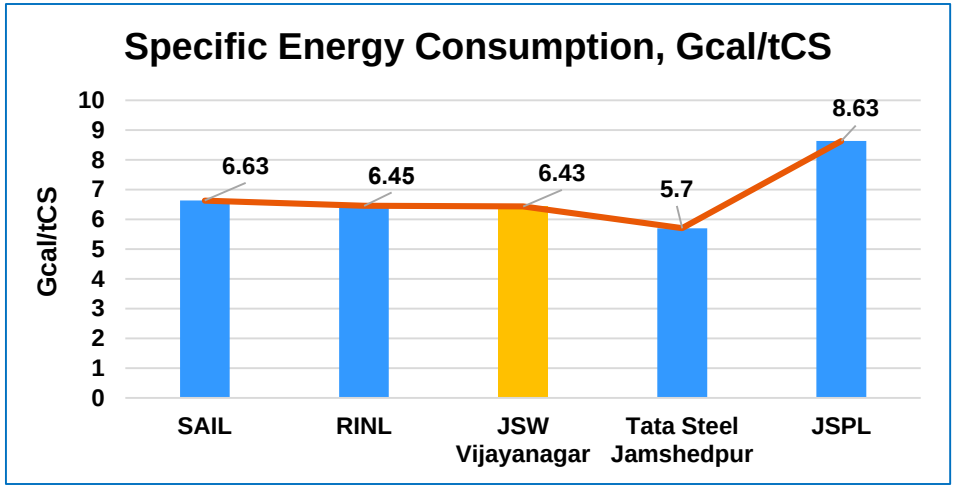
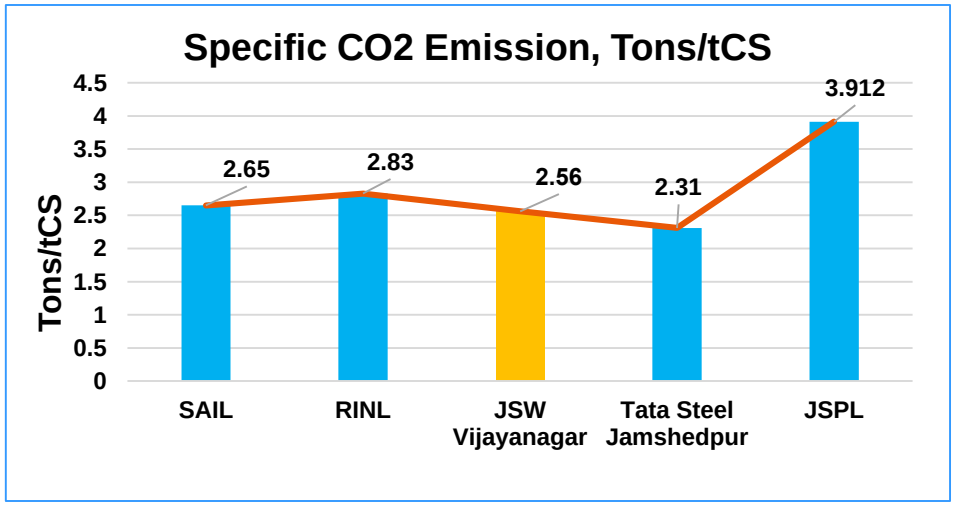
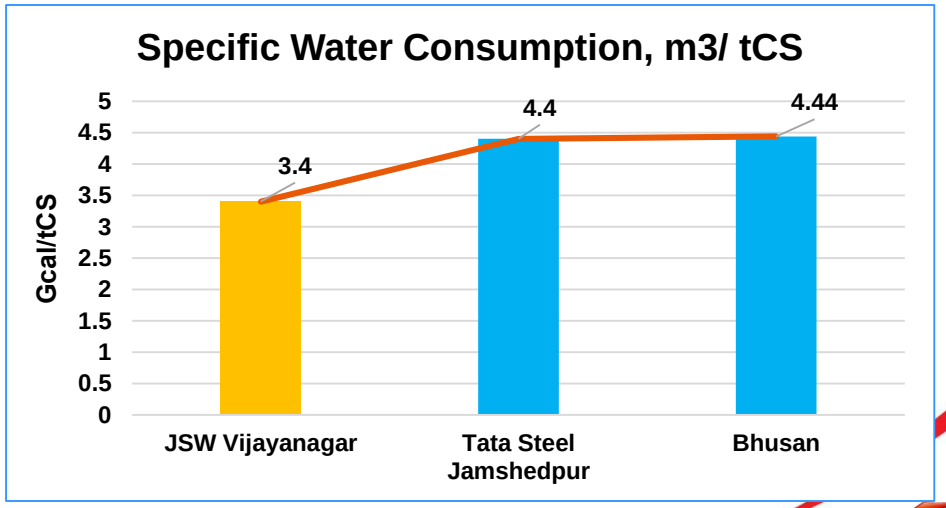
# JSW Steel vs Indian Steel Makers




*Source : Operating committee meeting on Sinter & BF – 2016*

# Comparison of Indian Blast Furnace Performance

| Indian BFs | | Productivity | Slag Rate | PCI Rate | Coke Rate | Fuel Rate |
|---|---|---|---|---|---|---|
| | | t/m3/day | kg/thm | kg/thm | kg/thm | kg/thm |
| Tata Steel | BF- H | 2.78 | 295 | 212 | 325 | 537 |
| JSPL | BF#1 | 3.30 | 412 | 119 | 426 | 556 |
| | BF#2 | 2.58 | 396 | 145 | 390 | 555 |
| RINL | BF#3 | 1.55 | 321 | 2 | 532 | 553 |
| Bhusan Steel | BF#1 | 1.33 | 402 | 113 | 353 | 535 |
| JSW Vjnr | BF#4 | 2.88 | 400 | 150 | 395 | 545 |

*Source : Operating committee meeting on Sinter & BF – 2016.*

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# Bench Marking Parameters at JSW Steel

- Specific energy consumption
- $CO_2$ emission
- **Waste** Utilization
- Value added grades of steel

# Counter measures taken at JSW Steel

| Indicators | Measures |
|---|---|
| Reduction in Specific energy consumption and $CO_2$ emission | ➢ Use of Corex export gas in DRI making and Reheating furnaces<br>➢ Increased PCI injection in BF (130 to 160 kg/thm) at higher slag rate<br>➢ Waste heat recovery at sinter plant through steam generation<br>➢ Upgradation of low grade iron ores through beneficiation<br>➢ Upgradation of BF1 from 0.9 to 1.9 MTPA capacity HM production (reduced fuel consumption and $CO_2$ emission) |
| Waste Utilization | ➢ Slime recovery plant<br>➢ Micro pellet plant<br>➢ Wsate to wealth plant (Fe & C recovery from dust and sludge)<br>➢ Mill Scale Briquetting Plant |
| Value Added Steel | ➢ Development of automotive 3rd Generation Steels (Ultra high strength steels)<br>➢ Development of high grade electrical steels (CRNO Electrical Steel) |

# Ore Beneficiation Plant (OBP) -- 20 MTPA processing capacity

**In order to maximizing the utilization of low and medium grade iron ores and to reduce the sp. energy consumption ;**

- **Setting-up of Ore beneficiation Plant**
- **Plan to set-up large (5500 $m^3$ ) Blast Furnace**
- **Usage of 100% pellet as feed to Blast Furnace for better quality and productivity**

**Commissioning**

- 2011
- Designed capacity - 20 MTPA
- Largest beneficiation plant in Asia

**Purpose**

- Upgradation of low and medium grade iron ore to feed agglomeration units

**Benefits**

- Reduced dependency on lump ore as the share of prepared burden is ~90%
- Significant cost saving
- Utilization of domestic low and medium grade iron ore
- Supply of desired feed quality to agglomeration units.

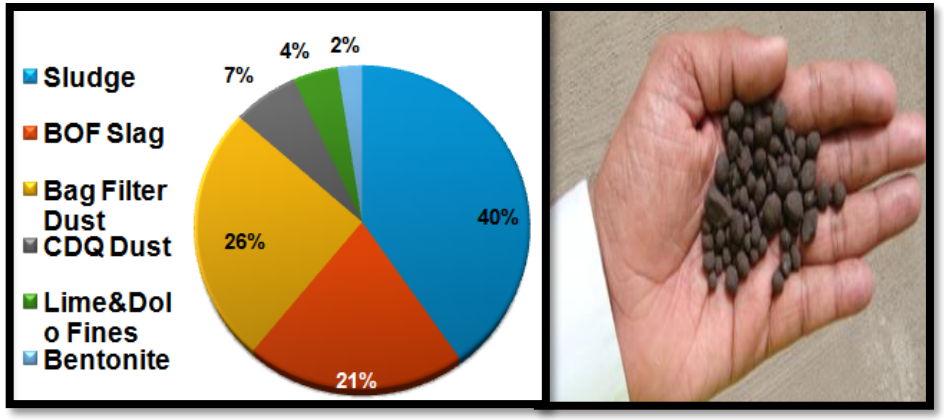
# Slime Recovery Plant (waste utilization initiative)

- **Feed to SRP: Beneficiation Plant tailing and Slimes from slime-ponds.**
- **Fe upgradation from 48 to 60 % with weight recovery of ~35%**

| | |
|---|---|
| Commissioning | • **2012**<br>• **Designed capacity - 0.50 MTPA** |
| Purpose | • **Recovery of Fe from tailing of beneficiation plant and Slime pond.** |
| Benefits | • **Waste utilization and Environment protection**<br>• **Recovery of 1000 T iron bearing material per day for pellet plant**<br>• **Avoids dumping of tailing in slime pond.**<br>• **Conservation of natural resources.** |

# Micro pellet Plant (waste utilization initiative)

First time in country




**Commissioning**

- 2013
- Designed capacity - 0.60 MTPA
- Avg. production:- 1900 T/day

**Purpose**

- Recycling of Dust (Bag filter dust, ESP dust, Lime & dolo fines, CDQ fines), Sludge and LD Slag fines in Sinter making through micropelletization.

**Benefits**

- Helps comply with environmental regulations on airborne dust emissions
- Reduction of solid fuel by 2 kg/T of sinter
- Use of iron bearing waste (~40% Fe in micropellets)
- Converts heterogeneous waste fines into homogeneous granules
- Spherical shape gives uniform permeability

# Waste to Wealth Plant (WWP) – Iron & Carbon Recovery

First time in country

**Commissioning**

- 2015 (Avg. production : 500 T/day)
- Designed capacity - 1000 T/day

**Purpose**

- Recovery and Upgradation of low-Fe sludge and dusts

**Benefits**

- Simple beneficiation circuit (Two stage magnetic separation).
- Fe upgradation from 40 to 63% with 40% yield.
- Concentrate (63% Fe) used in Pellet making
- Avoids dumping/shifting cost.
- Environment friendly technology

# Mill Scale Briquetting Plant (waste utilization initiative)

First time in country

**Commissioning**

- 2013 (650 T/day)
- Designed Capacity - 0.20 MTPA

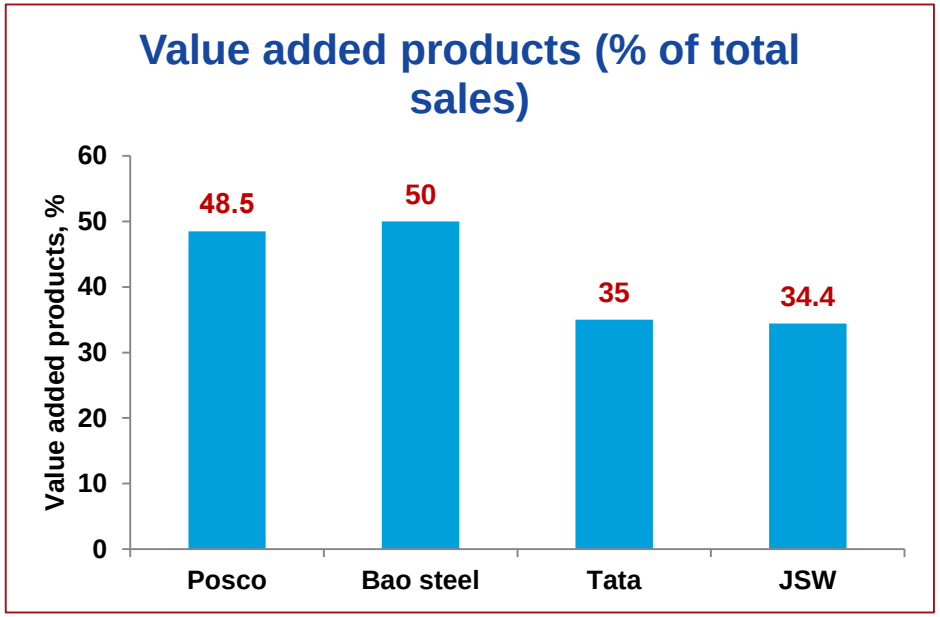
**Purpose**

- Reduce the scrap consumption
- Briquettes for use as Secondary Coolant in Steel Making

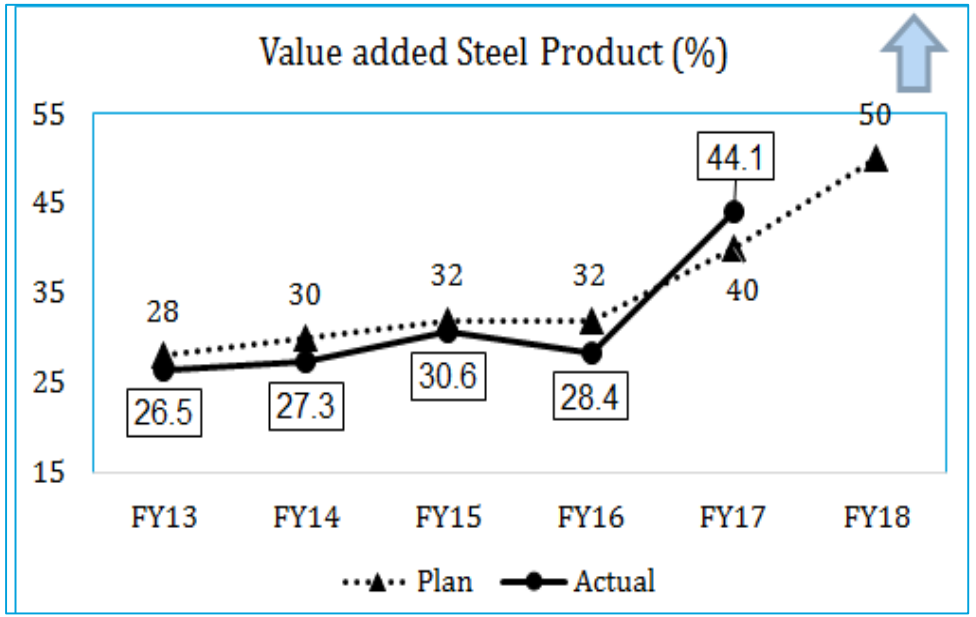
**Benefits**

- Replacement of iron ore in Converter
- High Fe input (~65%) and less silica load (~4%) as compared to iron ore
- No Bunker jamming
- No Red fumes
- Improved ID fan performance

# Value Added Products



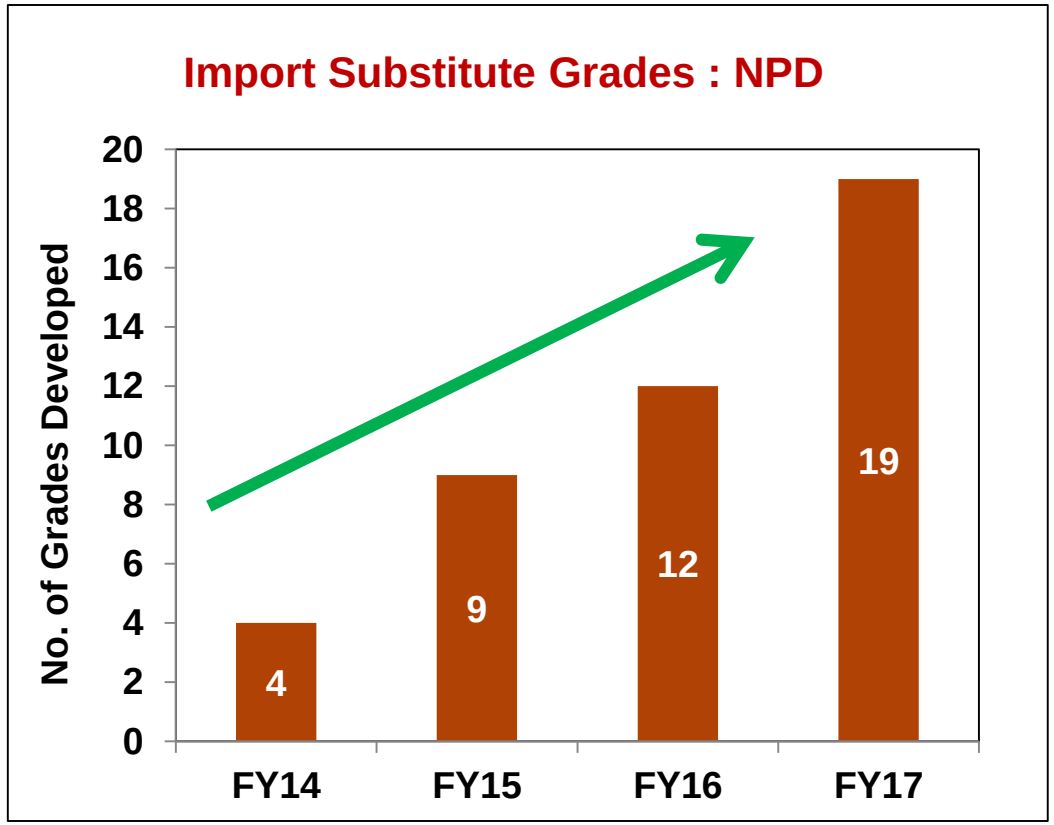

Source: Annual reports of respective plants- 2016




**JSW Vijayanagar Works**

# Make in India - Import Substitute in Automotive Grades

Outer Panel & AHSS bench marked with JFE Steel during Development




- Widest Expose Panel Steel
- IFHS & AHSS Steel
- Expose Panel & AHSS
- IFHS & AHSS Steel
- HSLA GA & BH Grades
- JAZ Super forming

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# JSW Roadmap

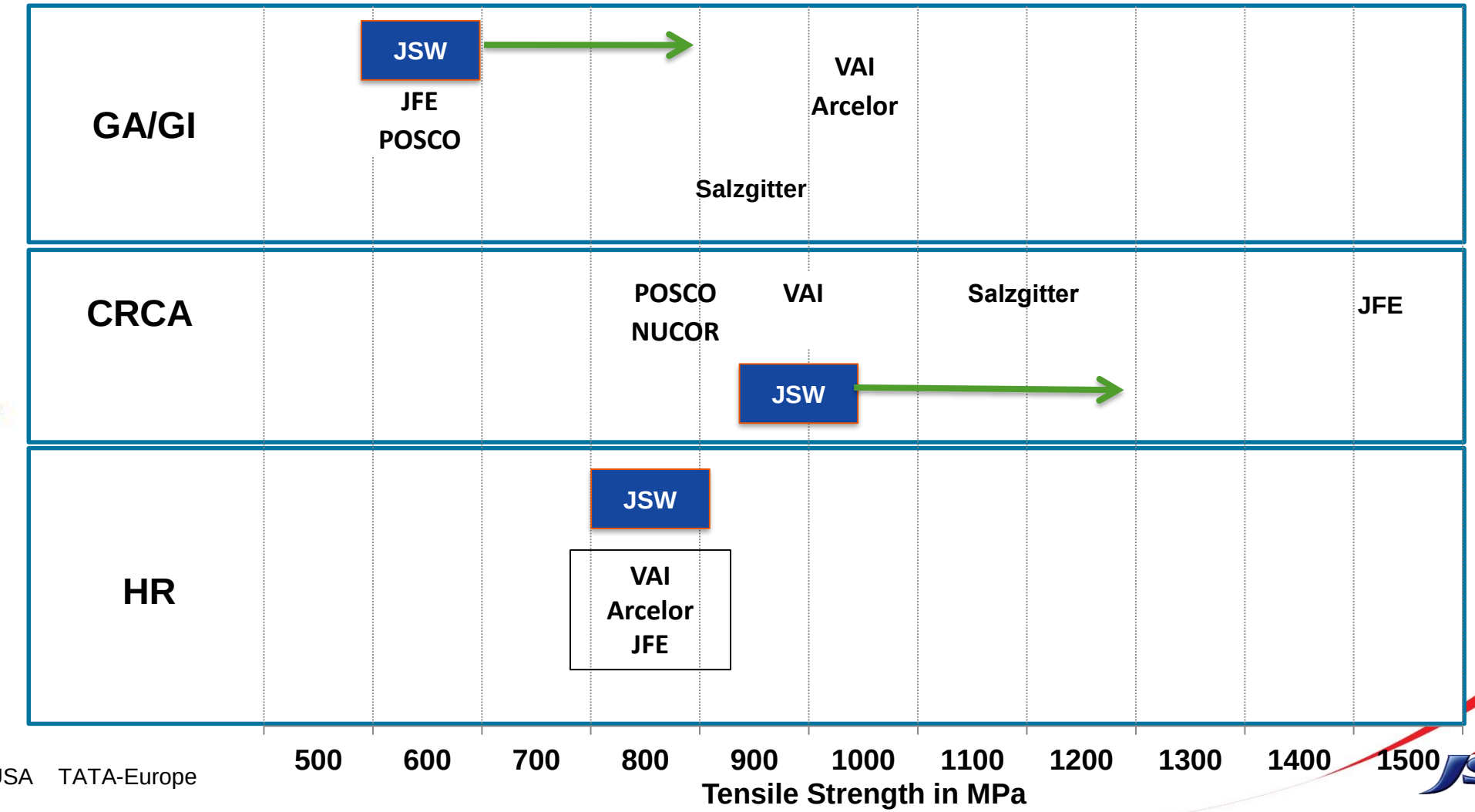
- To set-up new Blast Furnace (5500 $m^3$) to mitigate fuel consumption and $CO_2$ emission.
- Usage of 100% pellet as feed to Blast Furnace for minimized environmental impact
- Plan to upgrade existing BF3 from 4019 $m^3$ to 5339 $m^3$ working volume

- Dry slag granulation for heat recovery and power generation

- **Waste management**
  - 100% solid waste recycling (presently @ 88%)
  - Sustaining Zero liquid discharge

- **Value added product**
  - Development of automotive 3rd Generation Steels (Ultra high strength steels)
  - Development of high end electrical steels (CRNO Electrical Steel)

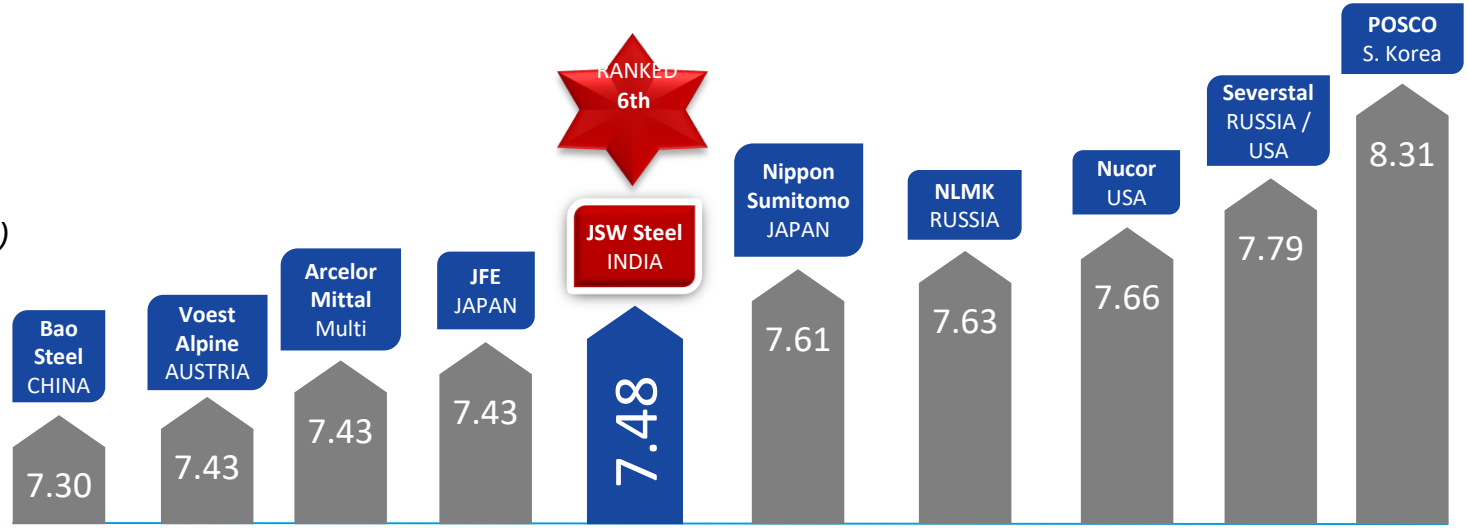
# JSW benchmark for value added products

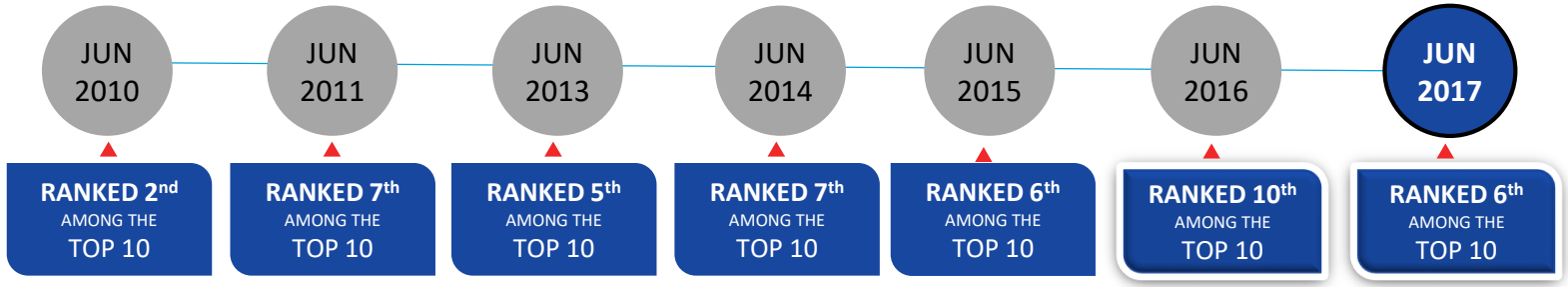



Salzgitter-Germany Nucor-USA TATA-Europe

# RANKED 6th AMONGST TOP 37 "WORLD-CLASS" STEELMAKERS

***Weighted-Average Score**
**Ranking** *(highest is most favorable)*




**HIGH FACTORS**

- Expanding capacity
- Location in high-growth markets
- Conversion costs; yields
- Labour costs
- Environment & Safety
- M&A, Alliances & JVs

SOURCE: World Steel Dynamics - Ranking as on June 2017
(based on 23 parameters)

# Ranking by World Steel Dynamics (based on 23 factors) - June 2017

| Factor | Weigh tage | POSCO S.Korea | Severstal Russia | Nucor USA | NLMK USA | NIPPON Japan | JSW Steel India | JFE Japan | Arcelor Mittal Multi | Voest Alpine Austria | Bao-Steel China |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | 5% | 9 | 6 | 7 | 7 | 9 | **6** | 8 | 10 | 5 | 9 |
| Expanding capacity | 5% | 9 | 6 | 8 | 7 | 5 | **10** | 5 | 3 | 7 | 10 |
| Value-added product mix | 5% | 9 | 6 | 6 | 6 | 10 | **7** | 10 | 8 | 10 | 9 |
| Conversion costs : yields | 5% | 9 | 8 | 10 | 7 | 10 | **10** | 10 | 7 | 9 | 8 |
| Energy costs | 3% | 7 | 8 | 8 | 8 | 6 | **6** | 6 | 6 | 5 | 6 |
| Cost-cutting efforts | 6% | 10 | 8 | 6 | 8 | 7 | **9** | 7 | 9 | 8 | 8 |
| Labour cost | 2% | 7 | 9 | 8 | 8 | 6 | **10** | 6 | 6 | 5 | 8 |
| Environment and safety | 4% | 9 | 9 | 9 | 9 | 9 | **9** | 9 | 9 | 9 | 9 |
| Ranking | | 1 | 2 | 3 | 4 | 5 | **6** | 7 | 8 | 9 | 10 |

***Source : World Steel Dynamics***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Thank You