JSW Bhushan Power and Steel

Optimization of EAF Tap weight by Improving the Refractory Design In SMS-1 & Best Operating Practices JSW Odisha

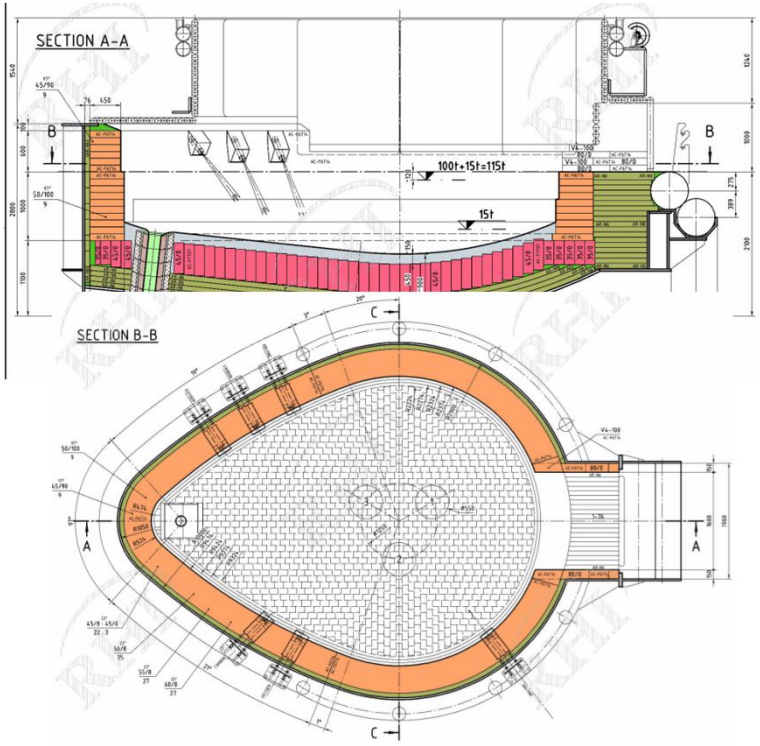
JSWBPSL

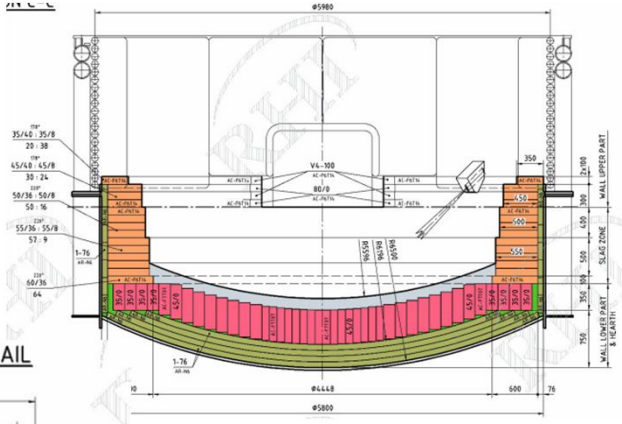
DATE : 23/09/2022

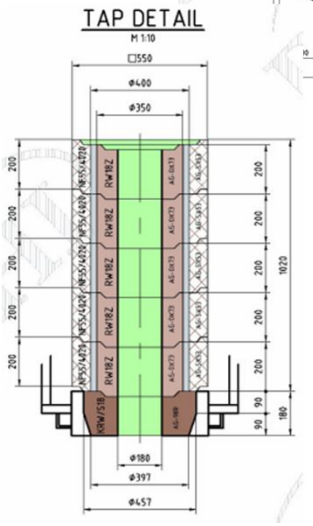
Modification EAF Lining Pattern

- The Bottom Shell Periphery / Outer dimension totally changed by bending plate at site .
- The Bottom Disc was kept Intact .
- The Refractory of Side wall totally change with Lower thickness and Improved Quality .
- The Bottom Bricks replaced .
- All the Design has been changed in house .

JSW BPSL SMS-1 EAF (OLD DESIGN)



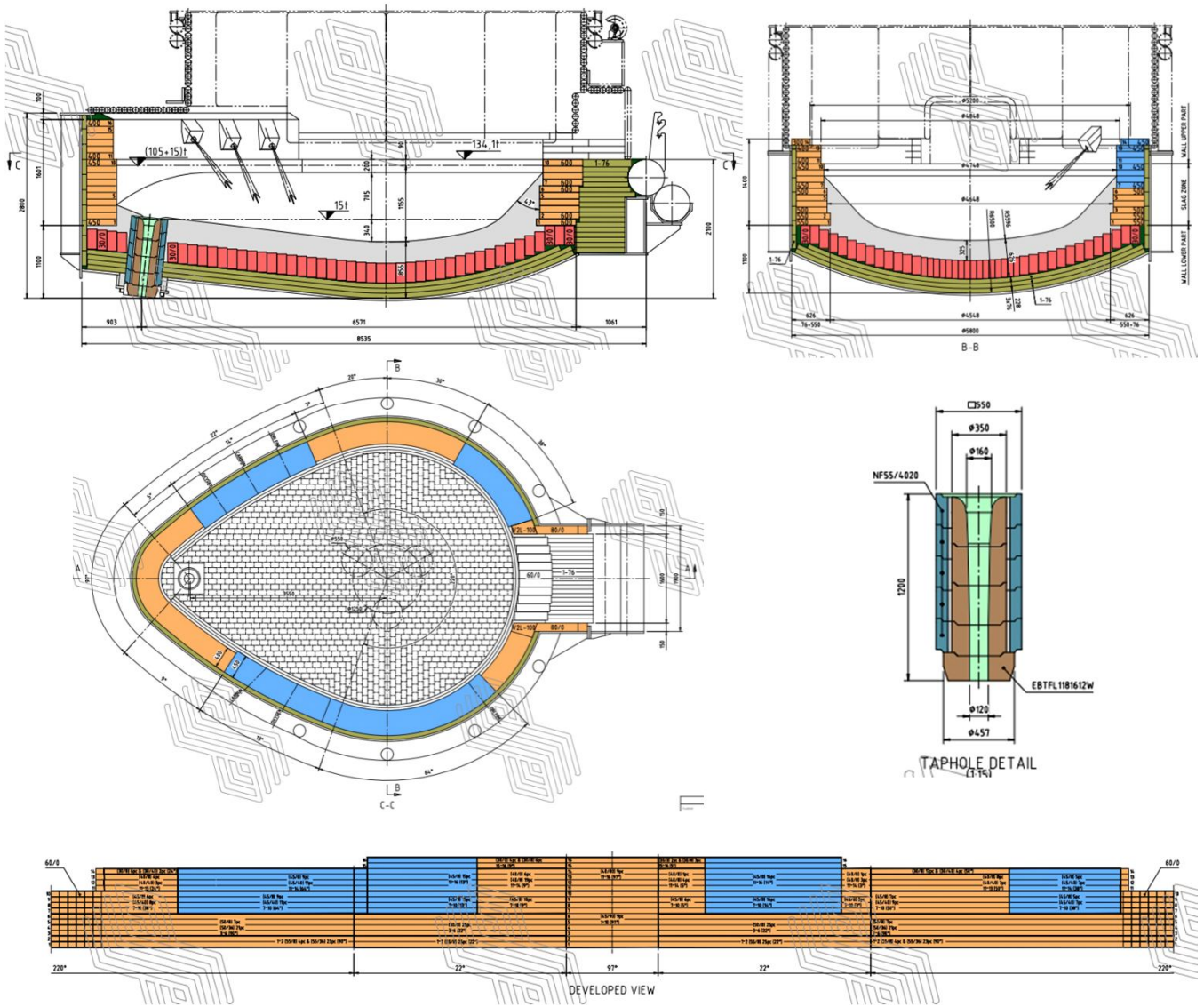




Summary of total unit

Quantity of bricks theoretic	:	119,319 to
Quantity of bricks incl. res.	:	123,825 to
Masses and mortars	:	15,700 to
Total	:	139,525 to

JSW BPSL SMS-1 EAF (NEW DESIGN)

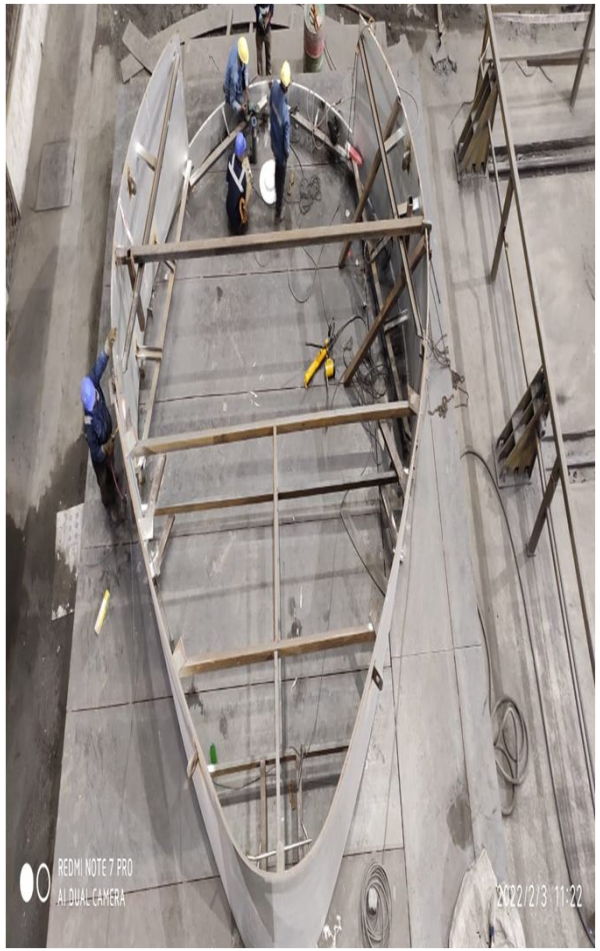


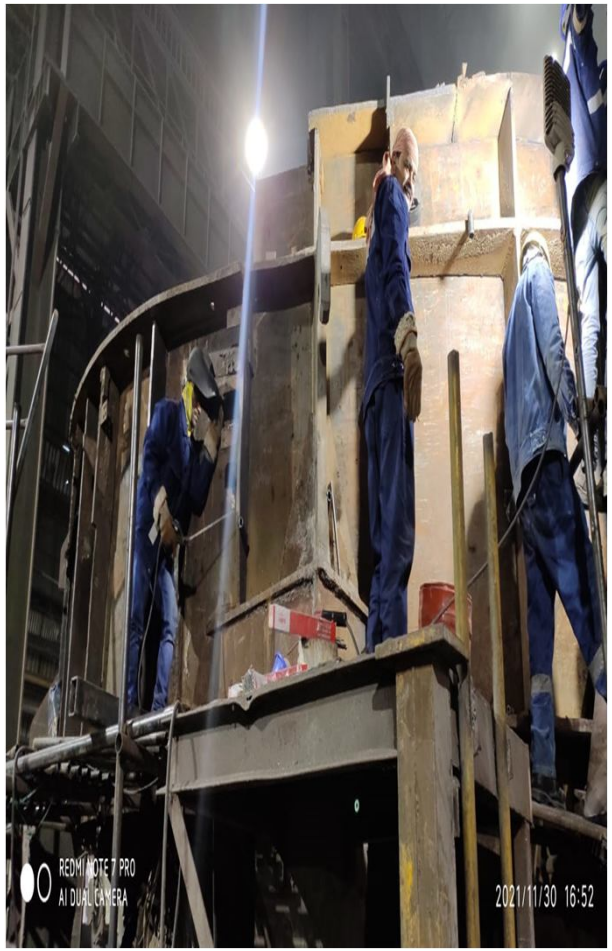
Total Weight	Net [t]	Total [t]
TOTAL	129.927	135.021
TOTAL	**129.927**	**135.021**

Weight per Brand	Net [t]	Total [t]
ANCARBON R F4E14	11.423	12.069
ANCARBON R F5E14	27.797	29.742
ANCARBON R F7E08	26.365	26.895
ANKER N4-CN	34.380	35.076
ANKERFIX CRP-CN	1.675	1.875
ANKERHARTH NN25	22.750	23.450
ANKERMIX NS13-CN	4.600	4.975
ANKERTAP CES478	0.308	0.308
ANKERTAP HMC153	0.530	0.530
OLIVIA FILL T	0.100	0.100
TOTAL	**129.927**	**135.021**

PROJECT ACTIVITY PHOTOS

MODIFIED ELECTRIC ARC FURNACE





PROJECT ACTIVITY

MODIFIED STEEL TEEMING LADLE

THANK YOU

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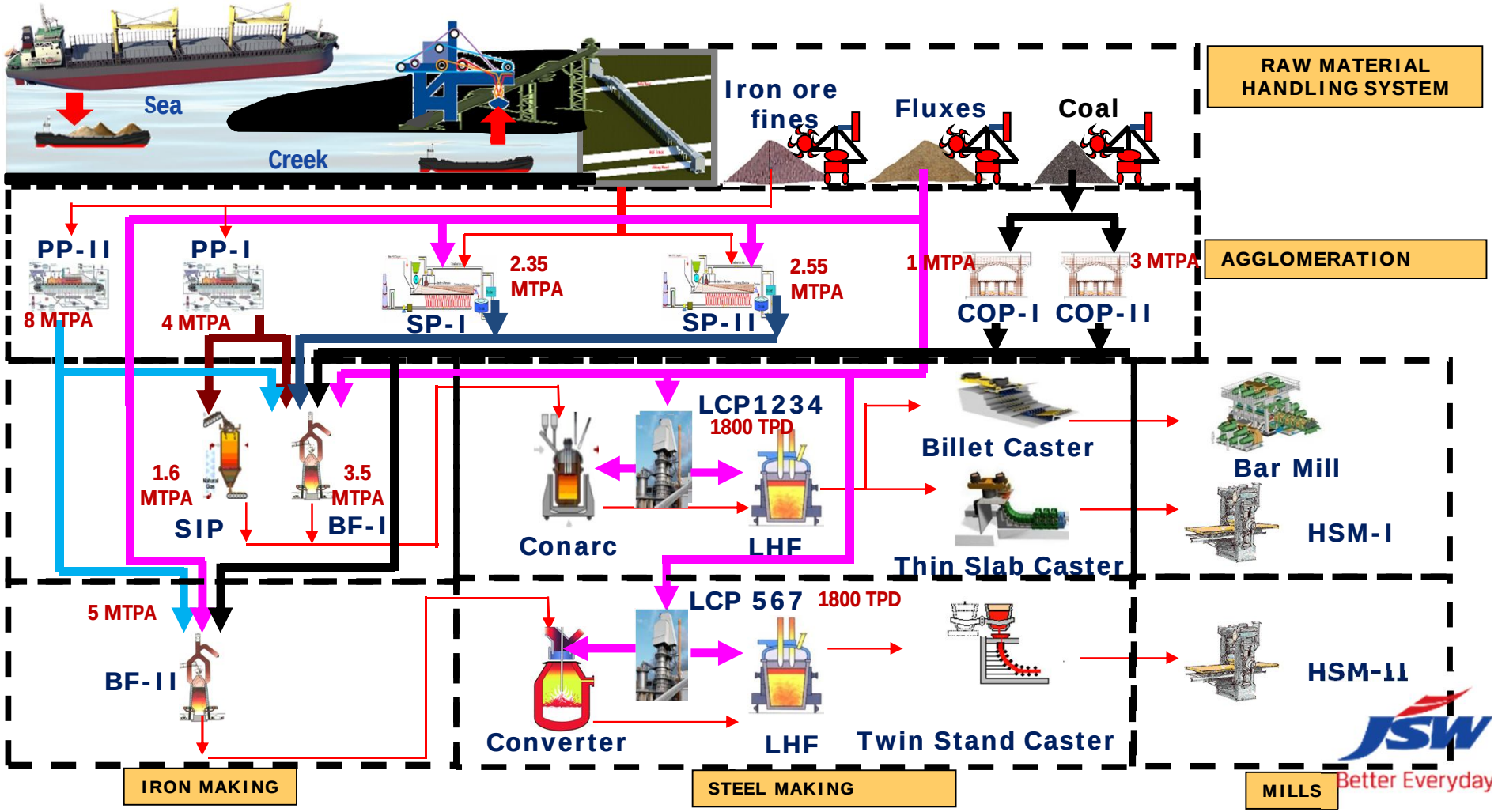
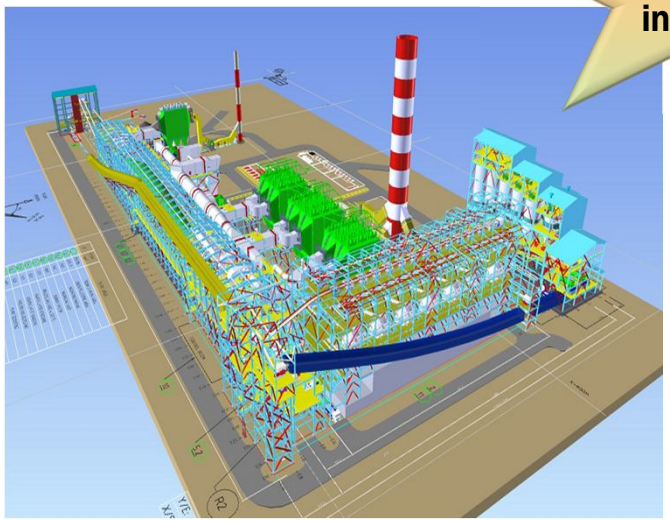
Future of Refractories in Steel Ladle & CDQ

Presented by::
B N Dubey
Nimananda Sahoo
JSW Steel, Dolvi

PLANT OVERVIEW-DOLVI



Pellet Plant



Largest in Asia

Pellet Plant 1:: 4 MTPA

- **Technology –** METSO, USA
- **Commissioned** – Feb'14

Pellet Plant 2:: 8 MTPA

- **Technology -** Outotech,Germany
- **Commissioned** – Jan'21

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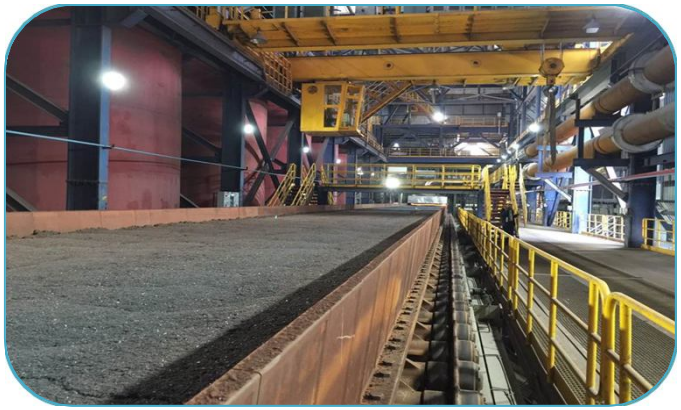
Sinter Plant & SIP



Sinter Plant (2.8 & 2.5)MTPA

- **Tech** - MECC China, Outotec Germany
- **Commissioned**- Dec'05, Feb'16

SIP 1.6 MTPA

- **Tech** - MIDREX, USA, Gas based, Vertical Type
- **Commissioned** – Oct'94
- Record of operating with 100% Iron ore Lump
- DRI production with part Coke Oven Gas

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Blast Furnace

Larges t in India

Blast Furnace 1:: 3.5 MTPA

- **Tech** – NSENGI, Japan
- **Commissioned** – Mar'16
- **Working Volume** - 4323 m3

Blast Furnace 2: 4.5 MTPA

- **Tech** – NSENGI, Japan
- **Commissioned** – Oct'21
- **Working Volume**- 5358 m3

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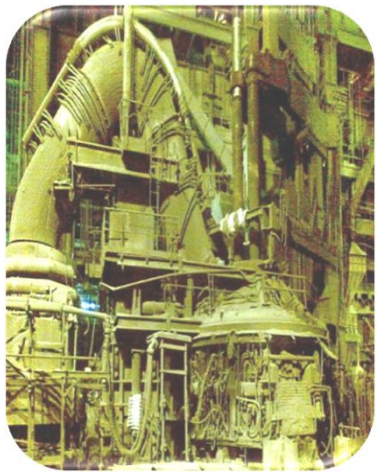
Steel Melting Shop



Largest in India

SMS 1:: 5 MTPA

- **Tech** - SMS Germany/India/UK CONARC Furnaces
- **Commissioned**-Apr'98
- **Furnace** - Twin shell EAF
- Eccentric Bottom Tapping
- Oxygen Top Lancing & Side lancing

SMS 2:: 5 MTPA

- **Technology** - SMS Germany/India/UK
- **Caster Type** - Twin Strand Slab Caster
- **Commissioned** - Oct 2021
- **Capacity** - 2x350 T BOF
- KR Process for desulphurization.
- LF & RH Degassing.
- Large size converter (350 t Capacity)

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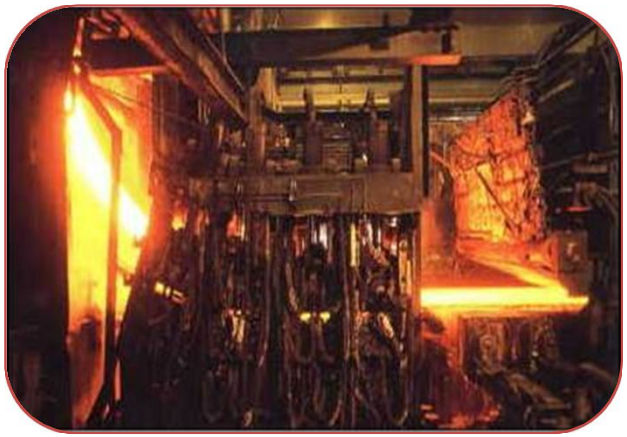
SMS 1:: Casting & Rolling



Thin Slab Caster (Two Nos.)

- **Tech** -SMS Siemag
- **Commissioned** - 1998
- **Slab Wd** - 900to1550 mm
- **Slab Thk** - 55 to 65 mm
- Metallurgical Length - 9.42m

CSP Mill 3.5 MTPA

- **Tech** -SMS Siemag
- **Commissioned** - 1998
- **Type** - 6 Stand
- **Strip width** - 900 to1550 mm
- **Strip Thk** – 1- 25mm

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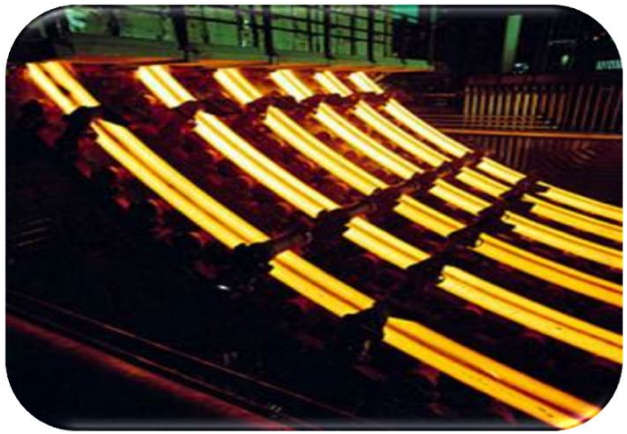
SMS 1::Casting & Rolling (Long Product)



Billet Caster 1.5 MTPA

- **Tech** – Danieli , Italy
- **Commissioned** – Mar'16
- **Capacity** - 1.5 MTPA
- **Metallurgical L** - 30m
- **Billet Cutting** - Oxy cutting

Bar Mill 1.5 MTPA

- **Tech** – Danieli, Italy
- **Commissioned**- Mar'16
- **No of Stands** - 14 nos.
- Reheating furnace capacity - 245 TPH
- 8-40 mm dia bar

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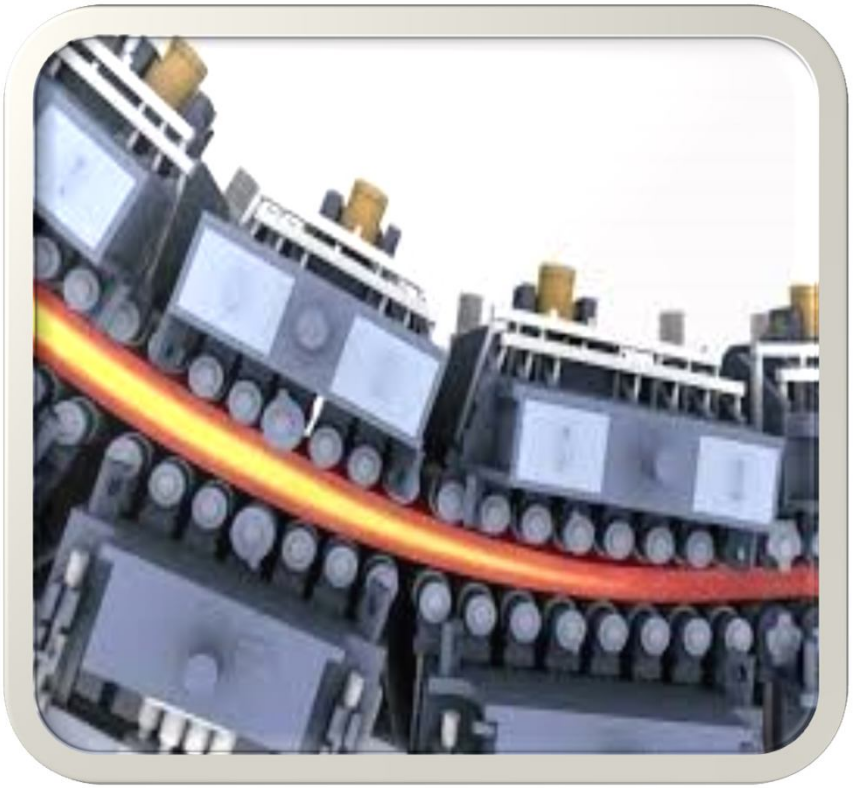
SMS 2 : Caster



Technology - Primetal Austria/UK/Japan/India

Caster Type - 2 X Twin Strand Slab Caster

Commissioning - Oct 2021

Slab width - 900 to 1650 mm

Cut Slab Length - 4.5 m to 12.0 m

Slab thickness - 220 mm

Casting speed - 1.95 mm (max)

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SMS 2:: Hot Rolling Mill

Technology - Primetal Germany/Japan

Commissioned - Oct 2021

Capacity - 5 MTPA

Mill Type - 7 Stand

Strip width - 900 to1650 mm

Strip thickness - 1.5 to 16 mm

Re-Heating furnaces - 2 X 450 t

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Coke Oven

Coke Oven 1:: 1 MTPA

- Tech- MECC Sino Steel, China
- Commissioned - 2014
- 2 batteries with 55 ovens each
- Stamp charging, recovery type

Tallest Stamp Charge in India (6.25Mtr)

Coke Oven 2:: 3 MTPA

- Technology - ACRE,China
- Commissioned- 2018-2019
- 4 Nos. of batteries with 62 ovens each
- Stamp charging, recovery type

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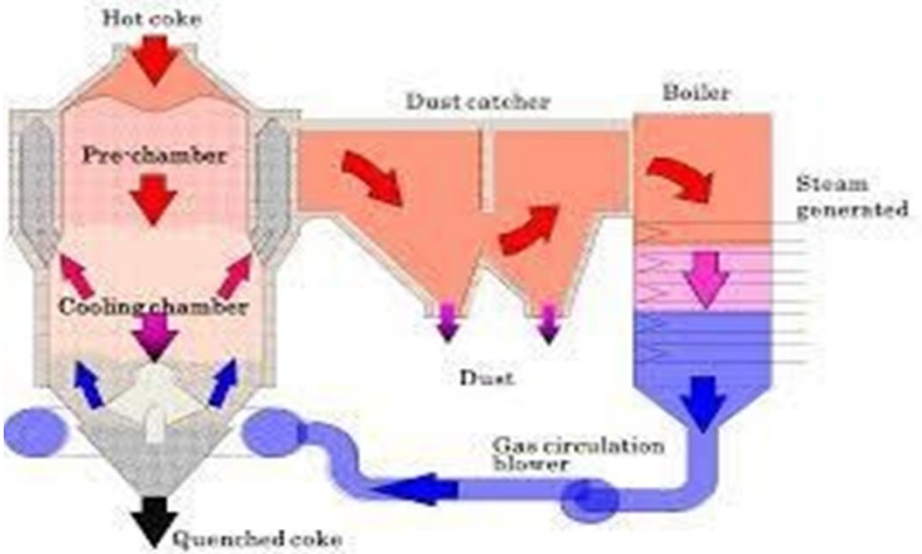
Future Of Refractories::
Coke Dry Quenching Refractory

compared with conventional wet quenching system, CDQ brings about advantages such as followings

- Reduction of dust emission
- Improvement of coke quality (Moisture Content is very Low)
- Low CO2 emissions than Wet Quenching
- No thermal energy loss as waste heat recovered in boiler to generate Electricity
- Environment-friendly



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Problem Facing in CDQ Refractory....

- Damage observed in pillars
- Cracks observed in pillars
- Increase of gaps in the bricks joint in the pillars observed
- Damage observed in some areas of arch

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Advantages of using Mullite-SiC bricks...

- High temperature properties like RUL & Creep
- High hot abrasion resistance.
- Wear resistance properties.
- Controlled Thermo-mechanical behavior
- Excellent thermal shock resistance
- Excellent mechanical strength at high temp
- Life can be achieved 2 years

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Why Mullite-SiC ?

- Passive oxidation forms a protective oxide film which limits attack of the SiC
- Its done in reducing atmosphere
- Its fired at very high temp to form glassy layer
- All the above helps in achieving desired properties required

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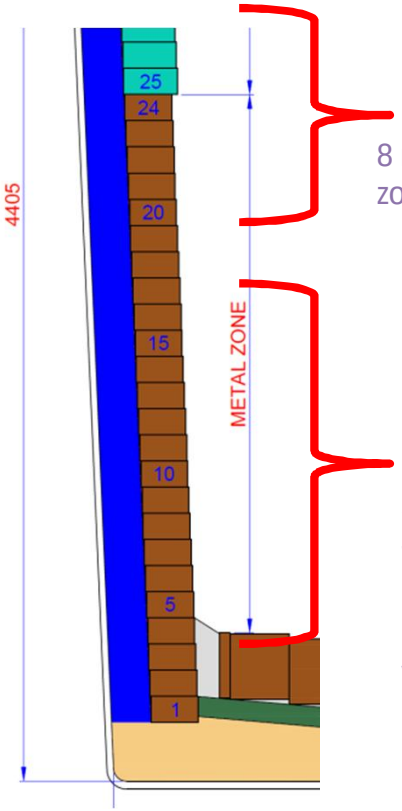
Future Of Refractories:: STEEL LADLE SHOTCRETING TRIALS (2 NOS)

As per the SOP of JSW Dolvi, rings in Steel Ladle are substituted until a LOT of 110mm minimum is found.

In the picture on the left are clearly visible:

1. The new slag line
2. The upper bricks of the metal zone substituted because of their residual thickness (< 110mm)



8 new (metal zone) brick rings.

Height of the (metal zone) shotcreting area.

The height of the total application area was about 1400mm.

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SHOTCRETING APPLICATIONS...

- New slag belt
- New brick rings of the metal zone (installed where the residual thickness was below 110 mm)
- Overlapping of shotcreting application onto the new brick rings

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SHOTCRETING MATERIALS...

General information	
Type of product	**Low Cement Castable**
Type of bond	**Hydraulic**
Maximum recommended temperature	**1800°C**
Main raw material	**Tabular alumina**
Material required (kg/m3) - Shot	**3150**
Material required (kg/m3) - Cast	**3050**
Maximum grain size (mm)	**6**
Water required for installation	**7-9% or 5-7%**
Installation method	**Shotcreting or Vibrating casting**

Chemical properties according to EN ISO 1927-3, EN ISO 21068-2	Typical (%)	Limit (%)
Al2O3	**91,7**	**min 89,7**
Fe2O3	**0,1**	**max 0,4**
CaO	**2,0**	**min 1,6**
SiO2	**0,1**	**max 2,1**
MgO	**5,2**	**min 3,7**

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Steel Ladle Shotcrete – Benefits…

- With 2 repairs 171 campaign life achieved
- Solution to drastic price increase of traditional brick.
- Reduce the dependency on Bricks.
- Manufacturing cost of Bricks is higher than monolithic.
- Supply chain shrinks – reduction in Inventory
- Cost decreases as we produce locally the castable
- Use of a Non MgO formulation will provide us with regional capabilities to manufacture and supply
- Solution to weak Metal Zone performance.

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THANK YOU

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