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Paper name: Adaption of Corundum Refractory lining Technology in Lime Dolomite Calcination plant and Major capital repair technique through top-down approach at SAIL-IISCO Steel Plant

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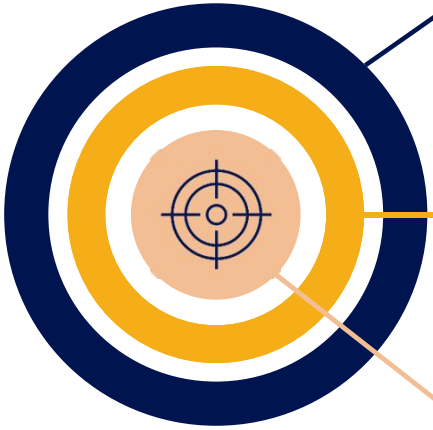
Projects:	• LITHIUM IRON PHOSPHATE BASED CATHODE MATERIAL DEVELOPMENT FOR LI-ION CELL • FABRICATION OF CONDUCTING POLYMER BASED THIN FILM AND IT'S IN-SITU STRESS MEASUREMENT FOR APPLICATION IN SUPERCAPACITOR • REALIZATION AND APPLICATION OF SIZE DEPENDENT FEM-SIMULATION FOR DEEP DRAWING OF RECTANGULAR WORK PIECE • VEGETARIAN THIN BONE CHINA BODY PREPARATION USING SYNTHETIC PHOSPHATE
Publication/ Patent	Title - Rectification of energy transport in nonlinear metamaterials via ratchets [2013] Journal Details - J. Phys. D: Appl. Phys.46(2013) 205102 (8pp)

Adaption of Corundum Refractory lining Technology in Lime Dolomite Calcination plant and Major capital repair technique through top-down approach at SAIL-IISCO Steel Plant

-*Presented by*
Prasanta Baidya

LDCP KILNS



01

Kiln Type Twin D shaft regenerative type calcination Kilns

Technology Supplier – CIMPROGETTI ITALY
Consortium partner – FL Smidth, Chennai INDIA

02

Number of Dolomite Kiln - 1

Capacity – 1x200TPD
Fuel – Mix Gas (CO & BF)

03

Number of Lime Kiln - 3

Capacity – 3x330TPD
Fuel – Mix Gas (CO & BF)

SALIENT FEATURES OF KILN

SAIL-ISP

Height and Cross section area of Kiln

Height – 36500 mm
Cross Section of Dolomite Kiln - 5.8 m^2
Cross Section of Lime Kiln – 8.8 m^2

Calcination Temperature

Lime Kiln – 950°C - 1100°C
Dolomite Kiln – 850°C - 1000°C

Discharge Temperature

For both Lime Kiln and Dolomite Kiln it is around 80°C

Combustion system & No of lances

Combustion system is Lance Fired
No of Lances for Lime kiln 60 & for Dolomite it is 36.

Mode of Discharge

Through Discharge Drawer and Vibratory feeder.

Flowchart of Lime-Dolomite calcination

At SAIL-ISP Limestone and Dolomite are calcined in Dual shaft Kiln through Mix gas from Coke Oven and Blast furnace in cyclic method for better heat recovery during operation

Input Raw Materials

Limestone (CaCO3): CaO- 53-54%, MgO- 1-2%, Silica- 1.5% max

Dolomite [CaMg(CO3)2]: CaO- 28-30%, MgO- 20-21%, Silica- 1.5-4% max

Feed Size: 25-55 mm

01

Combustion Air & Fuel

Mixture of CO & BF Gas

Calorific Value approx. 2600 kcal/Nm^3

Inlet Pressure – 70mBar

Boosted up to – 900mBar

02

Kiln Processing

Cyclic lance firing is done in both the shaft for better heat recovery

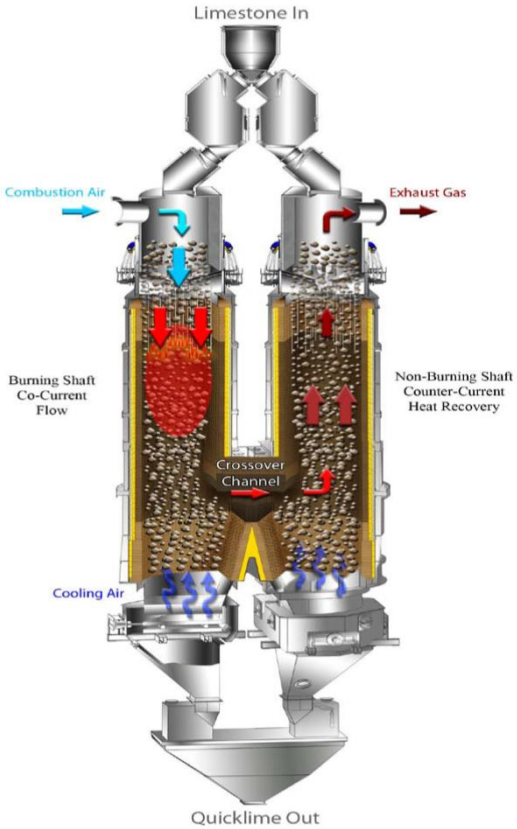
03

Final Product

Cooling air injected from the bottom of the kiln and Calcined Lime & Dolomite as a final product discharged from the feeder

04

Operation inside Shaft Kiln



Materials & Fuel

Raw Materials are fed and distributed from top of the kiln
Fuel (mixed gas / CO gas) Supplied through lances with combustion air

Combustion

Combustion starts in cyclic order. Approx 16 minutes it takes for single cycle in one shaft before it switchs to other one

Heat Recovery

Flue gas passes through crossover channel and pre-heat the materials in other shaft before combustion takes place in that respective shaft

Refractory lining inside kiln

Safety Lining

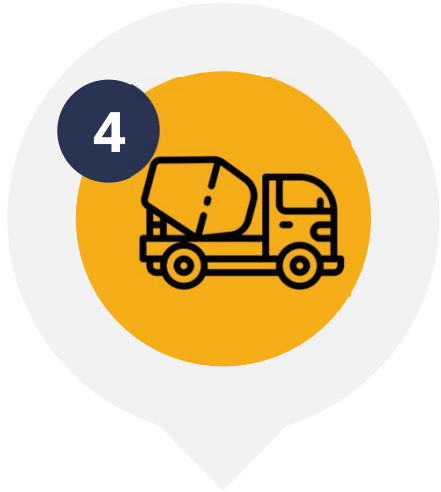
Mainly consists of Hysil insulation board, light weight alumina bricks and Medium duty fireclay bricks

Working Lining

Primarily high duty fireclay bricks and non-calcination zone and Magnesite bricks at calcination zone

Arch in crossover channel

Double arch present and they are based on Magnesite initially now changed to Corundum



Monolithic

Basic Mortar and High Alumina (90%) castables are used as per requirement

Key Problems

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Frequent Red Spot at Cross over area

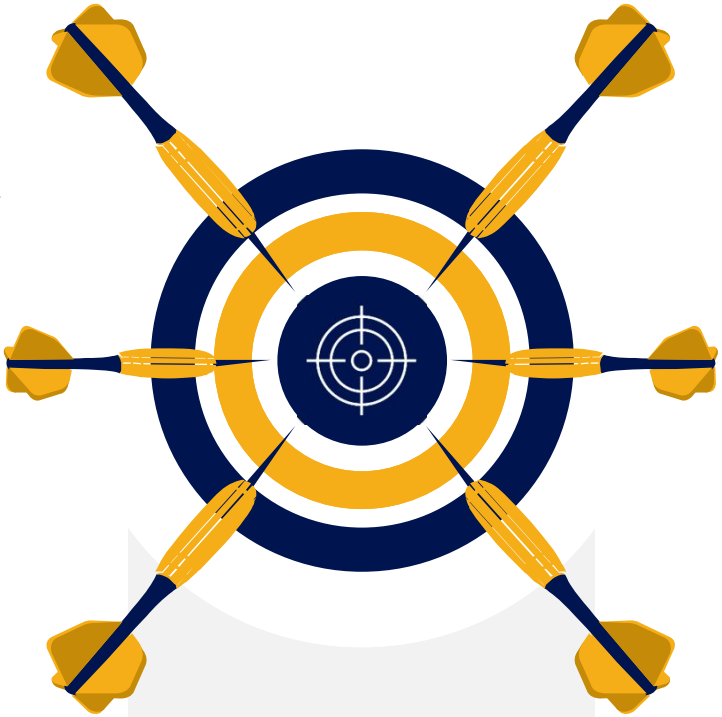
Red spots were often observed at crossover channel as filling bricks above the arch either got damaged or fallen inside the kiln

Damage of Arch bricks

Inconsistency in quality of gas, choking of combustion system affects the arch (Magnesite) through frequent Thermal shock

High maintenance cost

Frequent damages attracts higher cost of repair as primarily high alumina castable is used



High breakdown time

Damage of Arch creates a bottle neck for smooth production so it's frequent repair increase the breakdown time, .

High Refractory Consumption

Parallelly it increases the consumption of refractory and adds on the Kg/TCS .

Poor quality of lime &Dolomite

Due to damage of arch achieving optimum calcination temperature becomes tricky and resulted to poor quality of Lime &.Dolomite

Corundum as an alternative at Arch lining

What is Corundum?
Basically α-Al_2O_3

Why Corundum?
Thermal (0.5% at 1400^{o}C) and chemical stability

Cost effectiveness?
Corundum is costly compared to Magnesite (based on 2020)

Life Span?
Much higher compared to Magnesite in harsh condition(Already achieved almost double life)

Mechanical Strength?
Higher compared to Magnesite and less open pores ensures negligible microstructural defects/flaws

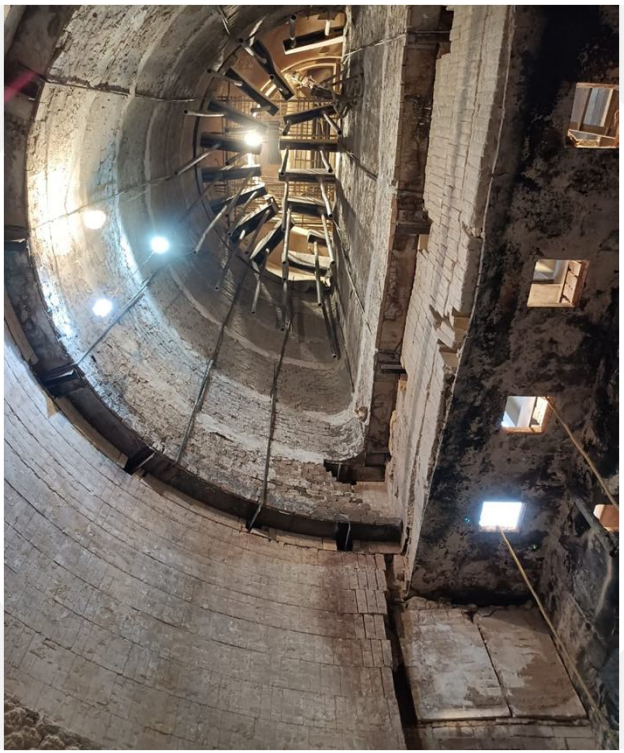
Storing and Application?
Its very user friendly due to not being hygroscopic

Capital Repair Technique

1

Top Down approach

Linings are done without emptying the burden starting form the kiln top



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How it is done?

Step by step process through segmented lining with the help of retainer plate (Approximate in every fifteen layers)

Safety Precaution?

Tie rods are welded after completion of every segment and lowering down the burden as per requirement

Cost and Time benefit

Almost 90% safety lining as well as alumina working lining becomes reusable and drastically reduce the downtime

4

3

Key Takeaway

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About Corundum

Corundum as refractory is highly stable and contribute less intrinsic compound formation.

1

Cost effectivity of Corundum

Corundum is highly cost effective and suitable for refractory application where application condition is harsh

2

Adaptive lining technique

Top Down lining technique is very much effective from time and cost both point of view

3

Cost and Time saving technique

This type of lining technique helps to achieve highest reusability of old bricks and also ensure minimum time frame for capital repair

4

Safety Perspective

All these changes are made by ensuring highest quantum of safety

5

Thank You

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