



# **Cement Limited**

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“ JSW Cement products & Durability ”

# “What are various JSW Cement products”

- PSC - Portland Slag Cement (IS 455 : 2015)
- CONCREEL HD (CHD) - Portland Slag Cement (IS 455 : 2015)
- PCC - Portland Composite Cement (IS 16415 : 2015)
- Screened Slag (IS 383 : 2016)
- OPC 53 - Ordinary Portland Cement (IS 269 : 2015)
- GGBS - Ground-granulated blast-furnace slag (IS 16714 : 2015)



**JSW  
PSC**



**JSW  
COMP CEM**



**JSW  
CONCREEL HD**



**JSW  
GGBS**



**JSW  
SCREENED SLAG**

# India's First Green Cement – Maintaining the Eco System - Issued by CII



Estimated, assuming a blast furnace slag content 45% in Portland blast furnace slag cement



- JSW Slag Products (PSC / Concreel HD) - Eco Friendly  
The products of BF Slag are highly regarded as environment friendly materials that can protect the environment by limiting the exploitation of natural resources and reduce the amount of energy consumed in the mining of natural Resources.

## ENVIRONMENTAL PRODUCT DECLARATION OF AVERAGE PSC CEMENT

ISO 14020:2006, ISO 14025:2006, ISO 14040:2006, ISO 14044:2006, EN 15804:2012, EN 16908:2017

EPD registration number:  
Publication date:  
Validity date:  
Geographical scope:

S-P-01414  
2019-10-11  
2024-10-10  
India

### Minimum Utilization of Natural Resources



Limestone



Solid Fuel



Electricity



Secondary Material



Water



## ■ PSC - Portland Slag Cement (IS 455 : 2015)

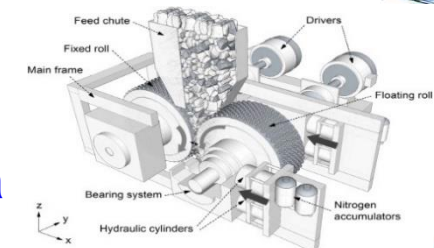
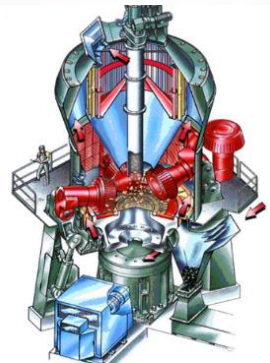
JSW PSC is a blended cement, where in some portion of OPC is replaced with Ground granulated blast furnace slag (GGBS), to make the structures long lasting & durable. GGBFS present in PSC helps in secondary hydration, producing more C-S-H gel in system for improved performance of concrete.

Blast furnace slag is the by-product from controlled process of iron production which results in an uniform composition. Blast furnace slag is a non metallic product having both siliceous & hydraulic property & when quenched rapidly , contains glassy particles that are highly reactive in nature.

Where as in case of Portland Pozzolana Cement, quality of fly ash from ESP widely varies, however

PSC is made by state of art technology, using roller press and vertical roller mill. The fineness and micro structure of PSC thus can be controlled and consistent quality is attainable.

PSC is a multipurpose cement and can be used in all construction works and is a 'Green product'.



- **JSW PSC** should be used over OPC, PPC as its long term strength is maximum . Besides, it provides high durability and resistance to chemicals and is an environmentally friendly cement.
- ✓ Long term strength of PSC is greater than OPC, PPC
- ✓ Provides protection against corrosion of steel reinforcement
- ✓ PSC makes concrete impermeable
- ✓ Allows Concrete cover to remain intact
- ✓ Resistance to sea water attack
- ✓ Resistance to sulphate, chloride, atmospheric water & harmful gases attack
- ✓ Long design life / durability of structure with low maintenance cost
- ✓ Lesser development of cracks

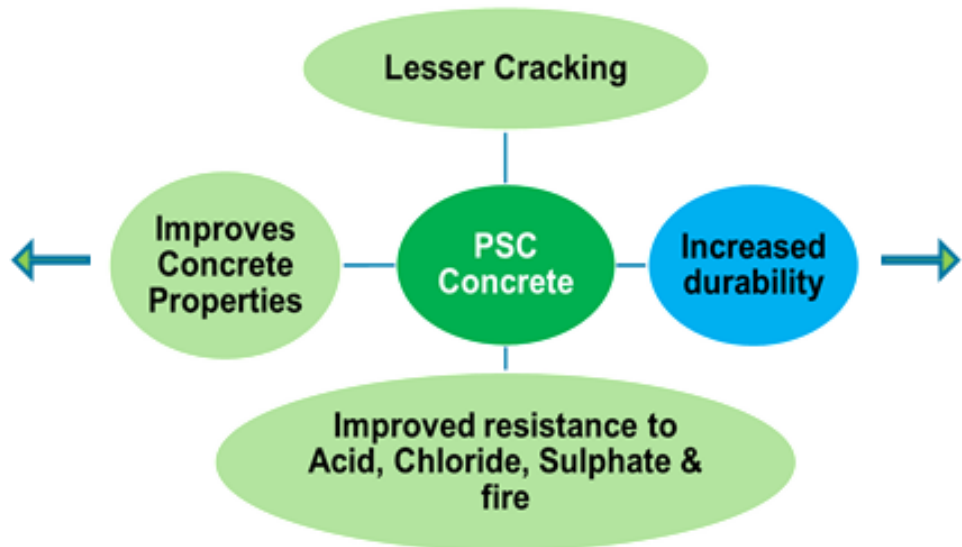


# Why JSW Cement ?

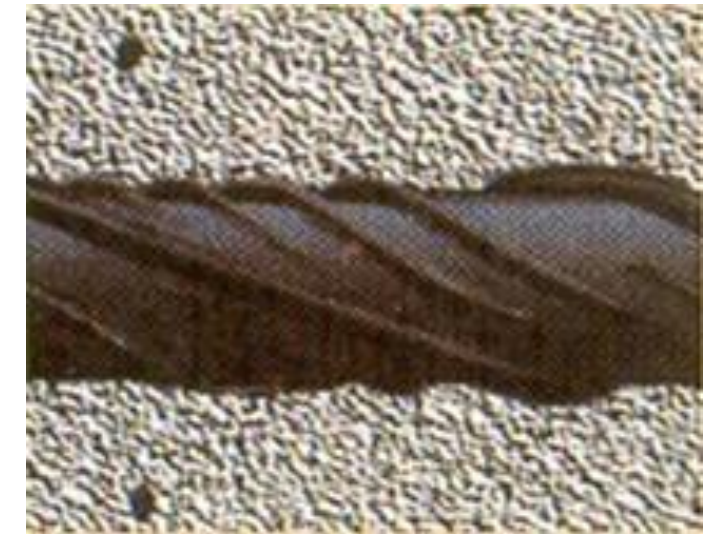
- Dispersion of Cement Particles
- Particle Packing Effect
- Secondary Reaction

Released Water

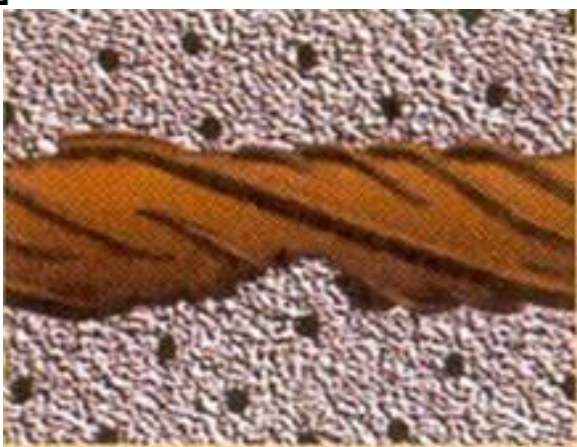
Cement Particle



- Improves Ultimate & Flexural Strength of Concrete
- Max. Reduction in heat of hydration.
- High Impermeability.
- Resistance to Chemical Attacks



**Electro micrograph of structure made with PSC with modified pore structure and increased impermeability. Chances of environmental Attack are minimized.**

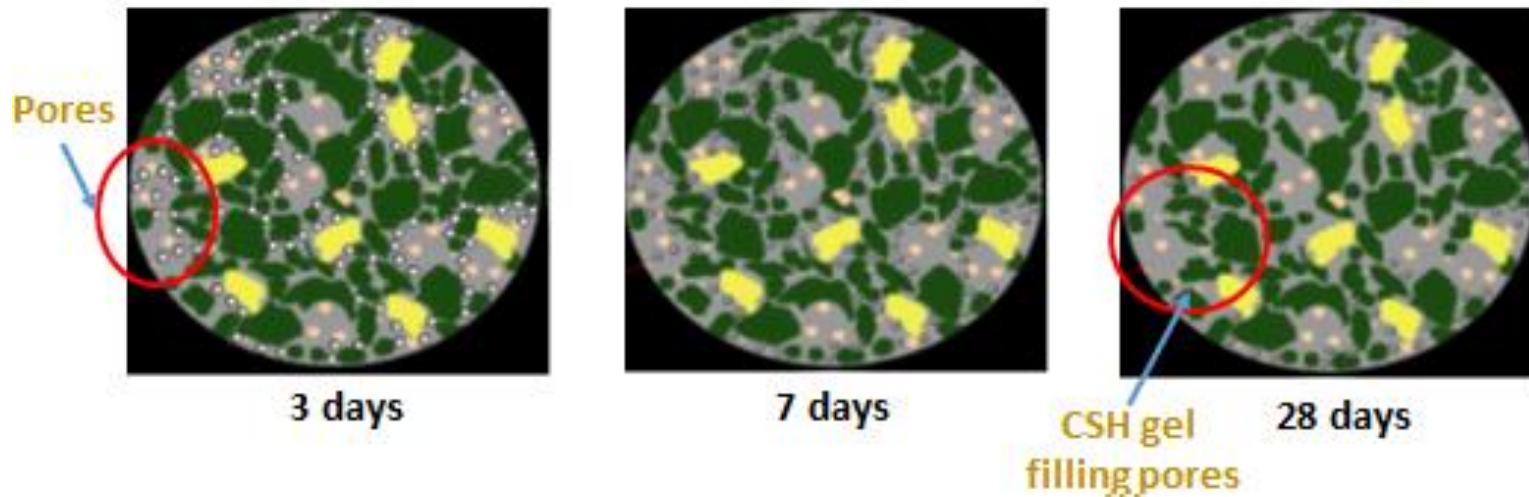
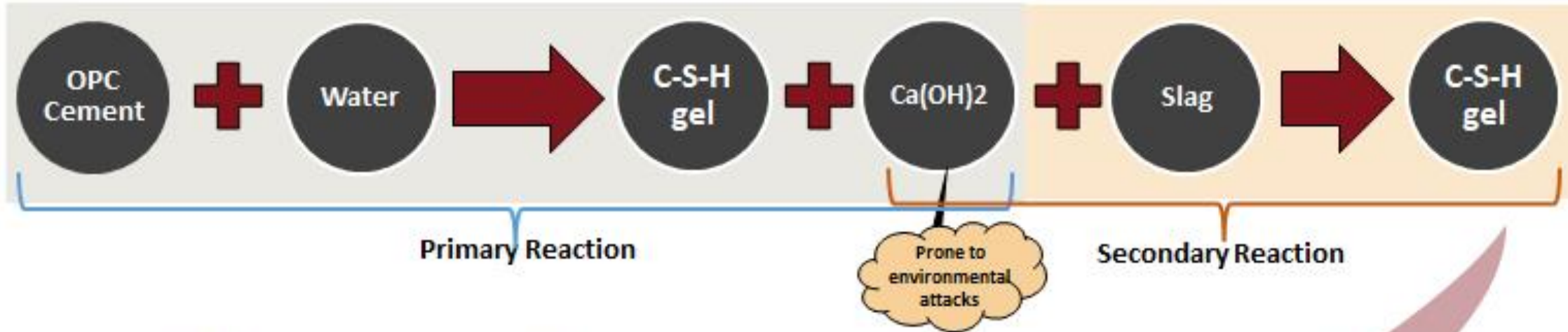


**Electro micrograph of Structure made with Ordinary OPC , having more pores and hence susceptible to greater environmental Attack**



# Why JSW Cement ?

- PSC has an added advantage over OPC/PPC as it increases durability against environmental conditions due to slag content



Double hydration and subsequent CSH leads to a reduction in pores over time

- **CONCREEL HD (CHD) - Portland Slag Cement (IS 455 : 2015)**

Concreel HD is a next generation 'green' cement specially designed for all concrete based construction requirements. **This is One Cement - with Six Strengths.**

Concreel HD provides high early and high long term strength along with quick setting, thus making it ideal for strength bearing applications such as beams, columns, slabs and foundations. A result of world class manufacturing process, Concreel HD is also an environmentally friendly product with Improved chemical resistance and superior cohesion, thereby providing more durability and increased safety to your structure.

Therefore, Concreel HD is the perfect solution not just for your concrete based construction needs but for many other applications.



- High Early Strength
- Quick Setting
- Superior Cohesion
- Most Durable
- Chemical Resistance
- Green Product



# Why JSW Cement ?



- We will offer you a cement that will challenge all the OPC & PPC players in the market

## Key Properties of OPC and PPC Cement



**High early strength**



**Quicker setting**



## We Will Offer A Product With Additional Superior Properties



**Superior Long Term Strength**



**Increased Durability**



**Chemical Resistance**



**Improved Cohesion**

# Why JSW Cement ?



- Introducing 'CONCREEL HD'



Specially made for  
CONCRETE applications



CONCRETE



STEEL



# Why JSW Cement ?



## ■ Introducing 'CONCREEL HD'

	CONCREEL HD	OPC Cement	PPC Cement
High Initial Strength <sup>1</sup>	✓	✓	✗
High Final Strength <sup>2</sup>	✓	✗	✗
Quick Setting	✓	✓	✓
Chemical Resistant	✓	✗	✗
Increased Durability	✓	✗	✗
Superior Cohesion	✓	✗	✗
Green Product	✓	✗	✗

1) Based on 1 day strength 2) Based on 28 day strength

Compressive Strength (Mpa)*	1 Day	3 Day	7 Day	28 Day
CONCREEL HD	18	31	42	58
Leading OPC Brand	20	37	46	57
Leading PPC Brand 1	15	29	37	52
Leading PPC Brand 2	15	29	37	56

\*Note: Compressive strength numbers are based on internal test results





# PCC - Portland Composite Cement (IS 16415 : 2015)



- PCC - Portland Composite Cement (IS 16415 : 2015)

JSW Composite Cement is latest revolutionary offering specially designed for all your concrete based construction requirements.

It is a perfect blend of **highly reactive slag and silica which** provides high concrete strength and durability, **better cohesion and ease of working**. It provides high early and high long term strength along with quick setting thus making it ideal for strength bearing applications such as beams, columns, slabs and foundations.

A result of world class manufacturing process, JSW Composite Cement is also an environmentally friendly product with Improved chemical resistance and thereby providing more durability and increased safety to your structure.

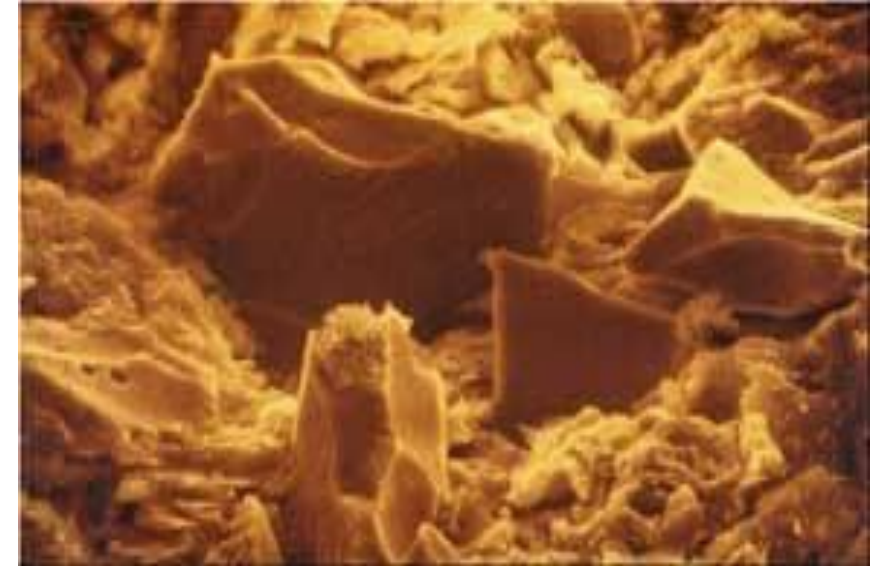
Therefore, it is the perfect solution not just for your concrete based construction needs and many other applications. Factory Fresh Cement JSW composite cement comes in a pack which keeps the freshness of cement intact for a longer period.



# Chemical Composition Of Slag

## As per IS 12089:1989 & IS 16714:2018

- Non metallic product.
- Consisting of glass containing silicates and aluminates of lime.
- Developed simultaneously with iron in blast furnace.
- Obtained by rapidly chilling or quenching with water or steam and air.

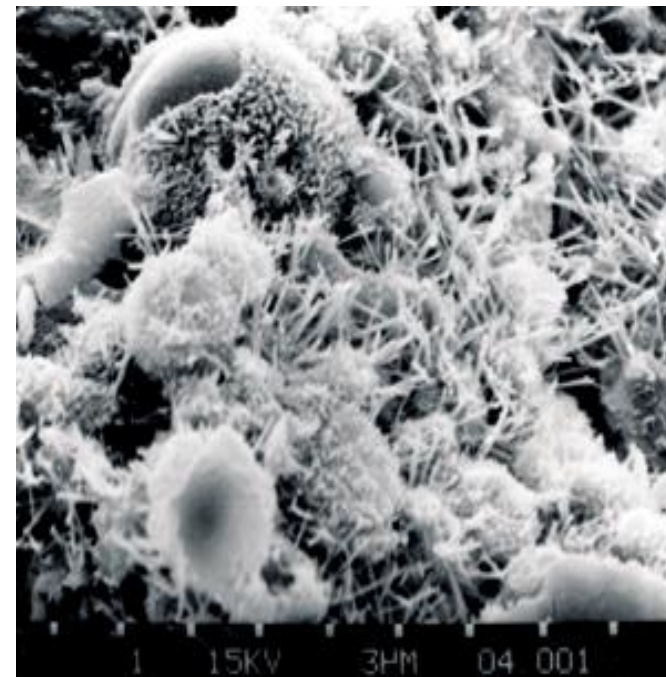
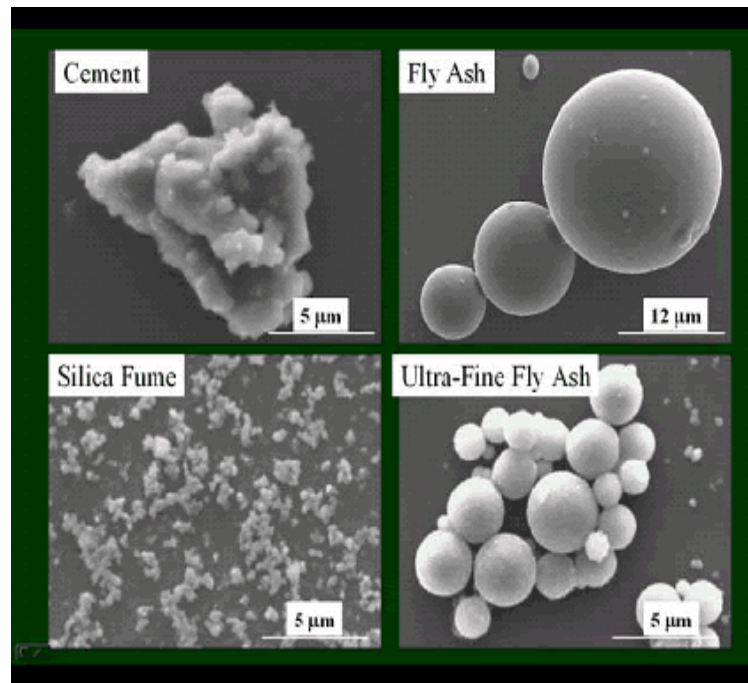


**Microscopic examination reveals the glassy nature of GGBS particles**

<b>CHEMICAL COMPOSITION</b>	<b>RANGE (%)</b>
SILICA	27 - 32
LIME	30 - 40
ALUMINA	17 - 31
IRON	0 - 1
MAGNESIA	0 - 17
GLASS CONTENT	85% MIN.

**Slag exhibits both hydraulic and siliceous properties**

Fly ash exhibit pozzolanic activities. A pozzolana is defined as “a siliceous or aluminous material which itself possess little or no cementitious value but which will, in finely divided form and in the presence of moisture, chemically react with Calcium hydroxide, at ordinary temperature to form Compounds possessing cementitious properties.”





# Super six advantages of COMP CEM



- High Strength
- Most durable
- Improved Workability
- Resistant to chemical attack
- Superior Smooth finish
- Green Product



**COMP CEM has applications right from foundation to plastering.**

# GGBS - Ground-granulated blast-furnace slag (IS 16714 : 2015)

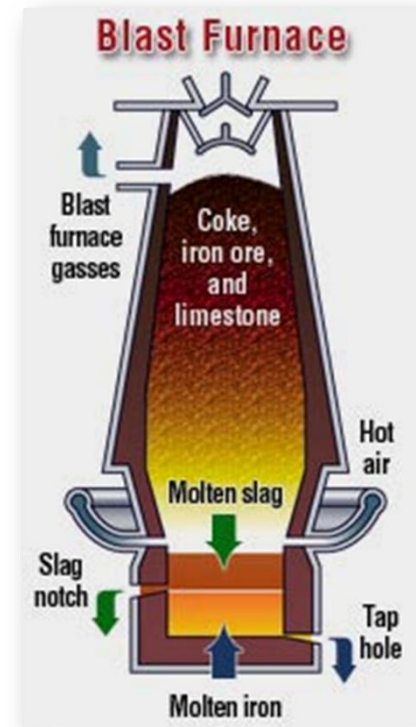
- GGBS - Ground-granulated blast-furnace slag (IS 16714 : 2015)

Slag is by-product from steel plant, which is obtained from blast furnace, during the separation of iron from iron ore. The process of granulating of the slag involves, cooling of molten slag through high-pressure water jets. This rapidly quenches the slag and forms granular particles. The resulting granular material comprises around 95%, non-crystalline calcium - aluminosilicates. The granulated slag is further processed by drying and then grinding in a vertical roller mill or rotating ball mill or roller press to a very fine powder, which is called GGBS.

It conforms to IS 16714 : 2018 and is a Green product, as manufacturing of same does not involve exploitation of any natural resources and is made from industrial byproduct which would be a burden on Earth if not consumed.

GGBS can be used as partial replacement of OPC Cement in concrete production at RMC batching plants and Site batching plants (mixing happens at site through high efficient mixers).

Usage of GGBS will give high ultimate and flexural strength, **chemical resistance** and **maximum durability**, along with reduction of thermal cracks due to low heat of hydration.



- Screened Slag (IS 383 : 2016)

JSW Screened Slag ( Alternate to river and manufactured sand / crushed rock fines)

Fine aggregates are an integral part of mortar, concrete, plaster. River sand are regarded as ideal fine aggregates. During recent years due to non availability of good quality river sand, crushed rock fines (CRF) ,are being used as fine aggregates. However CRF has some limitations such as– lack of moisture retention, making the mix non cohesive / harsh and has higher water demand.

Screened slag is an alternate to river sand as well as CRF. Slag obtained from blast furnace of steel plant is in the form of granules and looks like river sand, but is little greyish in colour. It is an inert material and is suitable for concrete and mortar, and can replace natural sand or CRF, up to a certain percentage (subject to field trials). The method of application of screened slag is same as that of river sand / CRF. This had been tested, both in India and Internationally, and found to be suitable to be used, in mortar and concrete.

Screened slag is superior to river sand because the latter contains fossils and other irregular particles like clay and silt that affects quality and durability. [Also dredging of river sand is not eco friendly.](#)





- What is Screened slag?

Screened blast furnace slag is sand like substance produced by spraying high-pressure water jets on blast furnace molten slag followed by screening to meet IS 383:2016 gradation criteria.



Screened slag



Screened slag manufacturing at Vijayanagar Plant

## ■ Why Slag as replacement of sand ?

- 1- Shortage of river sand
- 2- River sand mining damages eco-system
- 3- Prevents Illegal mining
- 4- High silt content in river sand
- 5- Having deleterious material Like – Coal, clay, lumps, lignite
- 6- Screened slag – Eco-friendly product
- 7- Screened slag- Durable structure
- 8- Availability of screened slag is through out year



Natural Sand



Crushed Sand



Mixed Sand



Manufactured fine aggregate ( Screened Slag)



1- Natural Sand

2-Crushed Sand

a- Crushed stone sand

b-Crushed gravel sand

3- Mixed sand

4-Manufactured fine aggregate

## What is Manufactured fine aggregate ?

Manufactured fine aggregate are fine aggregates which manufactured and not drawn from natural sources. It is prepared by processing materials ( Ex boulders/slag/fly ash), by using thermal or other process, such as separation, washing, crushing and scrubbing.

## JSW Granulated Blast furnace Screened slag

- Screened slag is an alternate to river sand as well as crushed rock fines .
- Slag obtained from blast furnace of steel plant is in the form of granules and looks like river sand.
- Manufactured slag is specified in Indian standard IS 383-2016, JSW Screened Slag meets all the requirement of IS:383-2016.
- Screened slag is an inert material and is suitable for concrete and mortar, and can replace natural sand or CRF, upto a certain percentage ( subject to field trials).
- In all developed countries, the use of Slags as aggregates to replace natural sand/rocks is well established and is in regular practice.
- In all developed countries, the use of Slags as aggregates to replace natural sand/rocks is well established and is in regular practice
- **Does not contain organic matter, clay, silt and shells.**
- **Green Product**





# JSW recommendation - Extent of utilization of BF Slag as replacement of Sand ( River/crushed )



## Advantages Over River Sand

	RIVER SAND	SCREENED SLAG
Marine Products	2 - 4%	Nil
Oversized Materials	6 - 10%	Nil
Clay & Silt	5 - 20%	Nil

Details	Mortar	Plain Concrete	Reinforced concrete	Remarks
Raw Granulated Slag( Non screened )	Not recommended in plaster , 100 % replacement for brick work with hand glove usage	50%	50%	In line with BIS guide lines & JSW internal study. It is better to avoid direct usage of raw slag in plaster owing to high glassy content, which may cause hand lacerations , if handled with out safety gloves at site. Same may be used in brick work with safety precautions
Raw Granulated Slag( screened- non VSI )	100%	100%	100%	in line with Indian Institute of Science study
Processed Granulated blast furnace slag ( screened and thru VSI)	100%	100%	100%	in line with Indian Institute of Science study

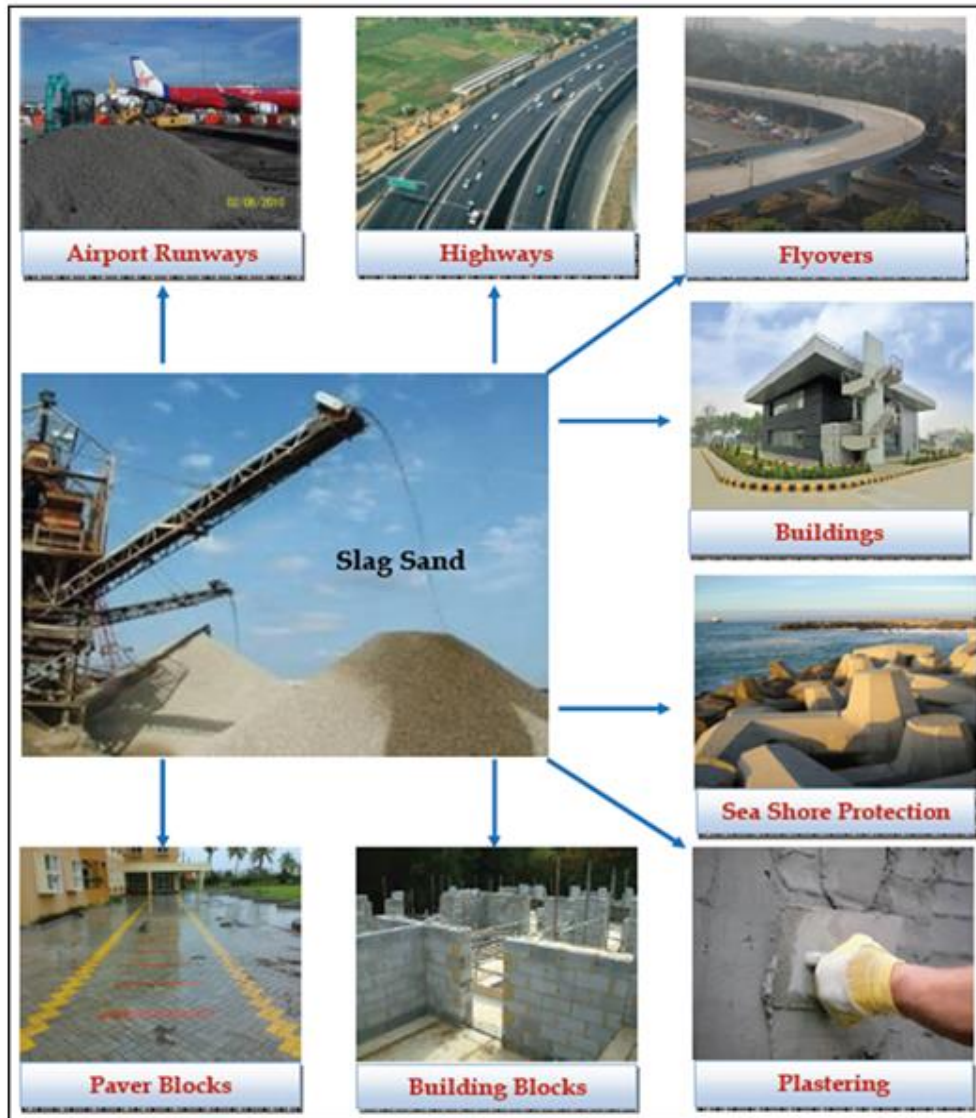
\* Final percentage replacement adopted at site will depend on mix design parameters & requirement

## Comparison of Properties

Properties	River Sand	Raw slag	Screened Slag
Size	IS 383 - Zone II (Fine)	IS 383 - Zone I (Coarse)	IS 383 - Zone II
Density, Kg/m <sup>3</sup>	1400 - 1700	1000-1100	1500
Sp Gravity	2.6 - 2.8	2.3	2.65
Water Absorption	1 - 3 %	4 -6 %	<3%



# Screened Slag - Application



- The method of application of Screened slag is same as that of river sand / CRF. Screened slag had been tested, both in India and Internationally, and found to be suitable to be used , in mortar and concrete.
- As replacement of natural sand or Crushed rock fine in concrete & mortar
- It can be used in-
  - Plain concrete
  - Reinforce concrete
  - Mortar
  - Plaster
  - Dry lean concrete
  - Pavement quality concrete
  - Ashphalt concrete etc.

- Screened slag doesn't contains fossils and clay.
- Has negligible silt content, thereby improving the strength parameters as compared to high silt content i.e. 10% to 20% in locally available natural/ manufactured sand
- Controlled physical and chemical properties
- Gives Improved strength to the concrete as compared to Natural sand because of its higher reactive silica content
- Improved durability of the structure during the lifecycle of the building thereby reducing lifecycle maintenance cost
- Reduction in Shrinkage Cracks
- Gives Improved bonding
- Smoother surface finish
- Improves cohesiveness of Concrete / Mortar / Plaster mixes
- Above all it is “**ECO FRIENDLY**” and conserves valuable natural resources for future generations, also it is available through out the year

# What is Durability ?

- ✓ Durability of cement concrete is defined as the ability of concrete to resist weathering action, chemical attack, abrasion or any other process of deterioration.
- ✓ Durable concrete will retain its original form ,quality and serviceability when exposed to the environment
- Durability by - Good cohesion, workability and reduced bleeding - due to optimum fineness.

Enhanced durability of construction - due to high soundness, low IR, low Mgo, low chloride.



# Factors Affecting Durability

- Type, quality & quantity of Cement
- Quality of aggregates
- Constructional defects
- W/C ratio
- Environmental Conditions
- Workmanship (Compaction, cover, curing etc.)
- Strength of concrete
- Quality of water





# JSW is a \$13 billion conglomerate with presence across key sectors



**JSW Steel**

India's leading integrated steel producer with 18 MTPA steel capacity



**JSW Energy**

Serves the entire energy value chain with a total capacity of 4,531MW



**JSW Cement**

Manufacturer of 'Portland Slag Cement' and 'GGBS' with capacity of ~14 MTPA



**JSW Infrastructure JSW Paints**

Operates environment friendly seaports & terminals with capacity of 200 MTPA

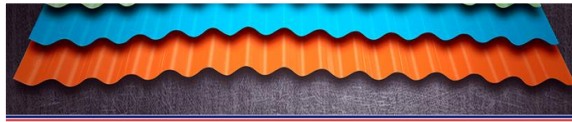


Started in October 2019

# OUR CONTRIBUTION TO INDIA'S PROGRESS



ENHANCING THE QUALITY OF EARLY  
**CHILDHOOD EDUCATION**  
THROUGH INTERVENTION IN OVER **120 ANGANWADIS**



## JSW PRAGATI

A unique customized roofing solution for the aspiring India

**200,000+**  
SCHOOL CHILDREN NURTURED  
WITH MID-DAY MEALS

Sakshi Malik ends India's wait for a medal with a bronze in women's wrestling. She is only fourth Indian woman athlete to win an olympic medal.

JSW is a proud sponsor of Sakshi Malik

**#RuknaNahiHai**

**PROVIDING  
EARLY STAGE FUNDING**  
TO TECHNOLOGY-ENABLED START-UPS IN EDUCATION,  
HEALTHCARE, FINANCE, SAAS AND ENTERPRISE SOFTWARE.

**JSW CEMENT**  
for Hyderabad Metro Rail

### VOCATIONAL TRAINING CENTRES

<p><b>BALLARI</b> 1000 students trained in association with NTTF 900 women trained and employed in textiles &amp; apparel 700 students trained in industrial safety and metallurgical engineering</p>	<p><b>RATNAGIRI</b> 107 students given non voice BPO training 57 women trained in fashion design</p>
<p><b>VASIND</b> 2000 students trained in engineering, repair, dressmaking and beauty</p>	<p><b>DOLVI</b> 44 students trained in computer hardware &amp; beauty</p>

**GETTING WHEELS ROLLING  
BY BUILDING 34KM OF  
NEW RAIL LINE**





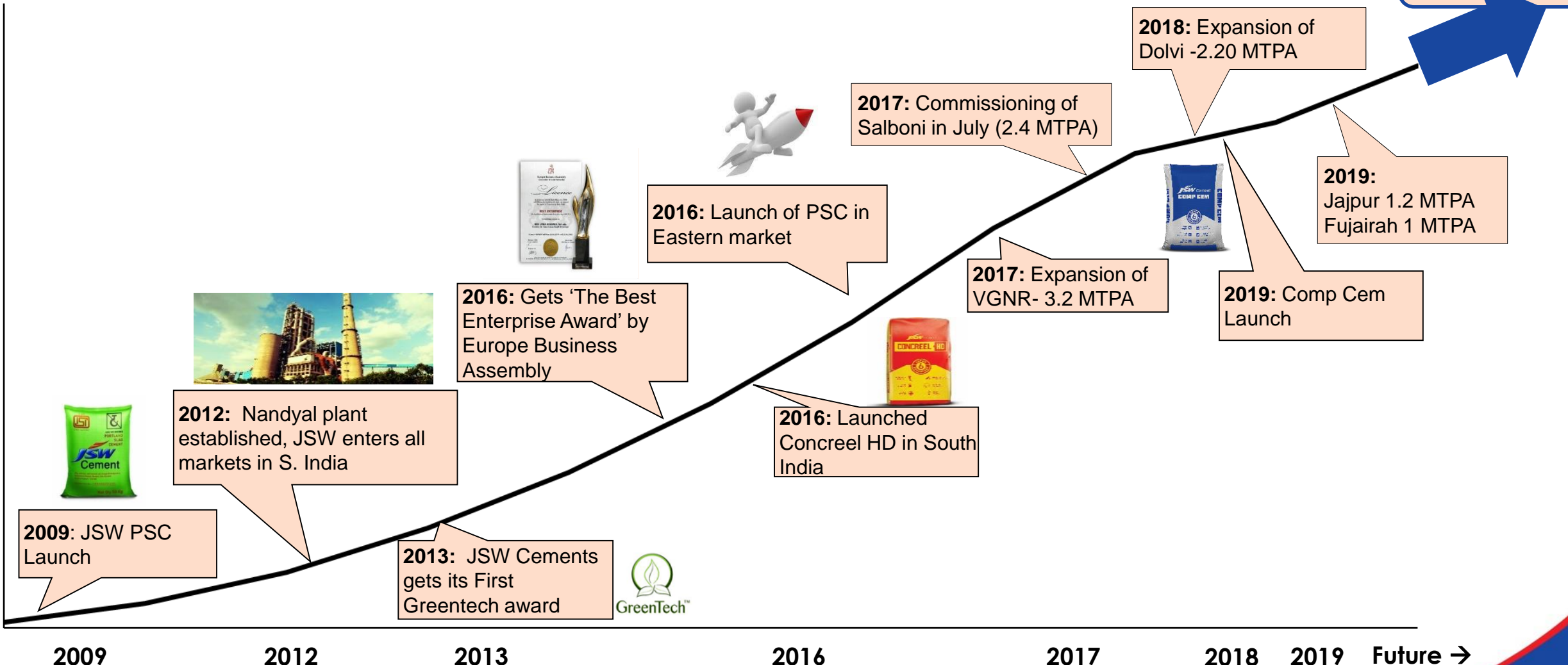
# The JSW Cement Journey



**VISION**  
To become a 20 MMT company



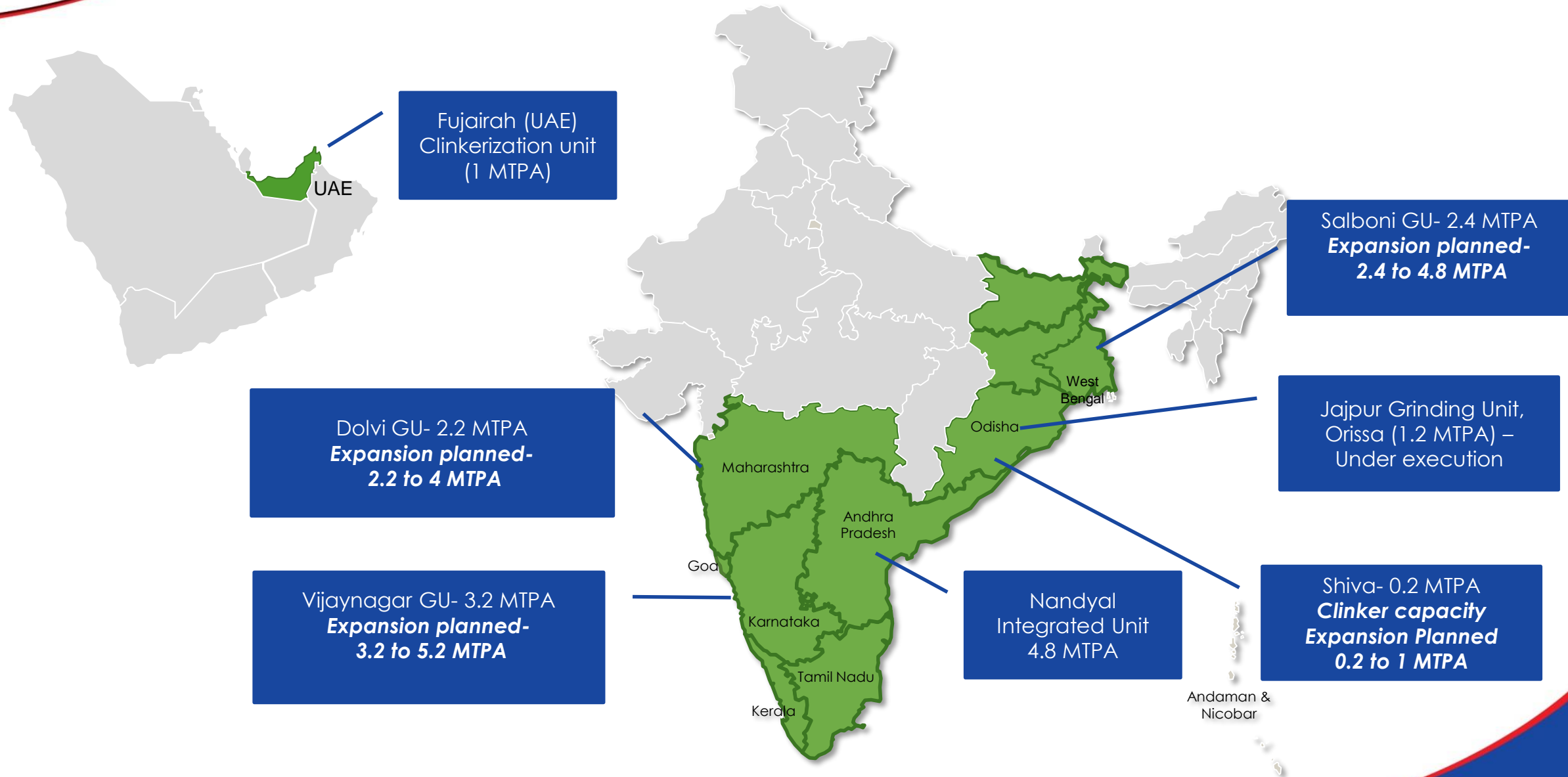
SALES VOLUMES



2009      2012      2013      2016      2017      2018      2019      Future →

TIME

# Capacity expansion planned across plants in the next 3-5 years to become a 20 MTPA player





A decorative graphic in the top left corner, featuring a blue background with white and red curved lines that sweep upwards and to the right.

❖ **Thank You**