JK Cement LTD.

JK Cement Works Muddapur

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CII Environmental Best Practices Award– 2020

Kiln Chimney NOx Reduction by Hot Bottom Formation

Presented by:
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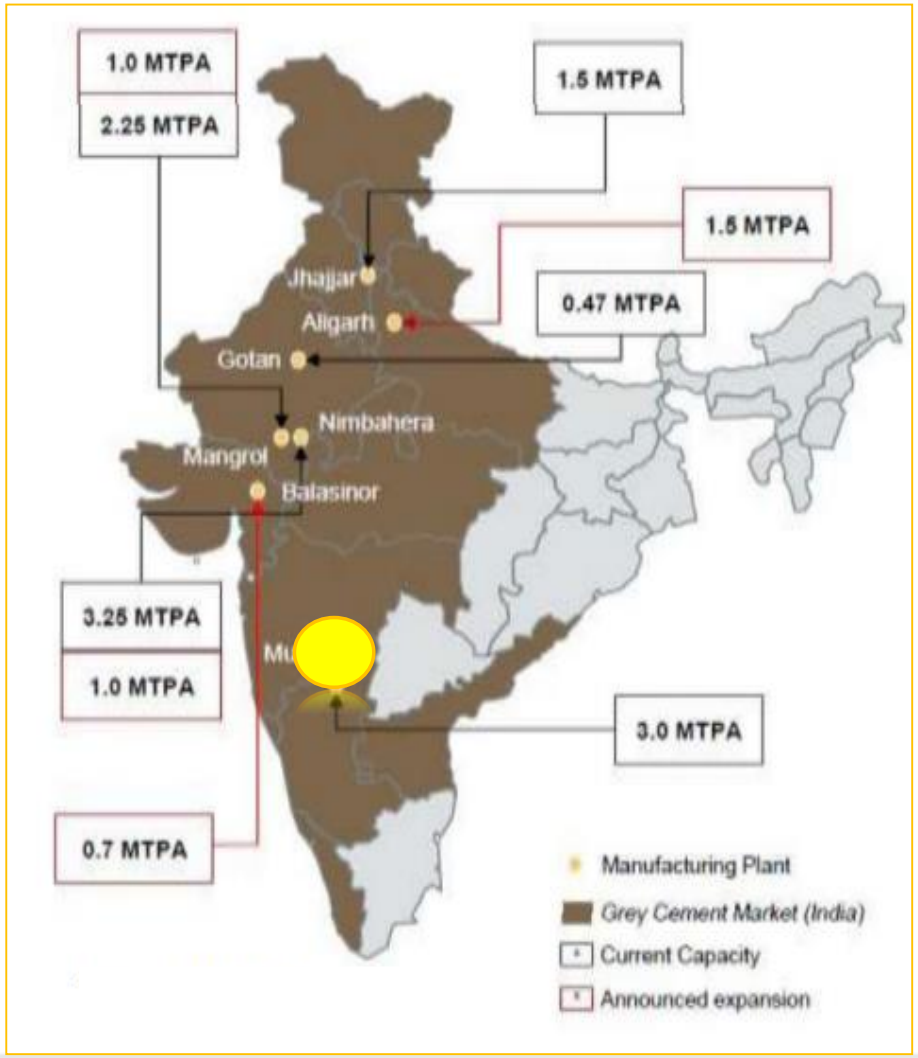
ECO FRIENDLY

About JK Cement Limited



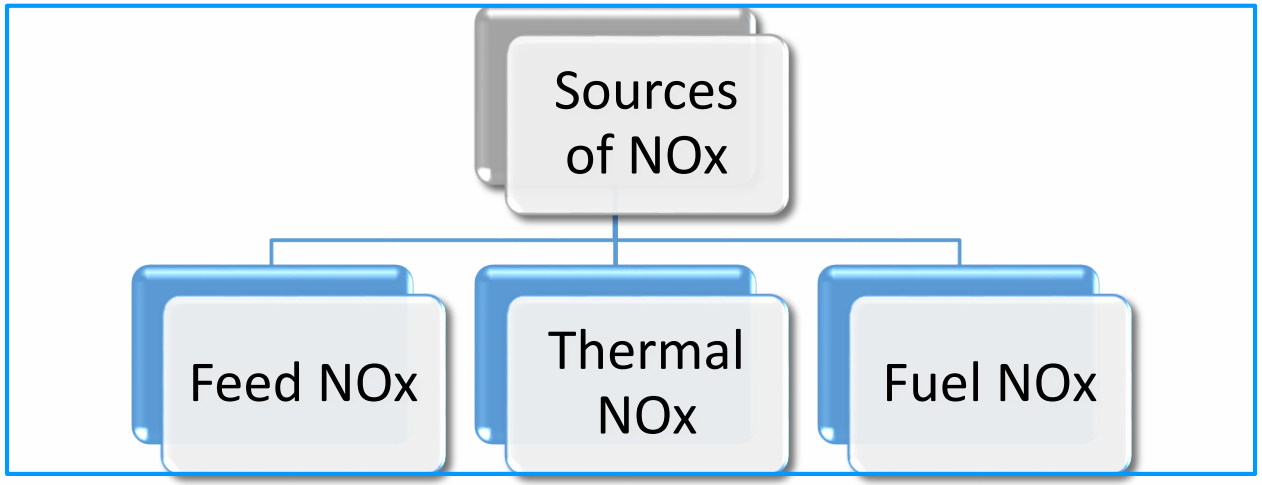
J.K. Cement Ltd. is a part of Industrial conglomerate JK Organization the Company is promoted by Mr. Yadupati Singhania . The group entered the cement manufacturing business in 1975.

Grey cement capacity of 16.0 MTPA & White cement capacity of 1.2 MTPA

JK Cement Muddapur having Capacity of 2.20 MTPA Clinkerisation & 3.50 MTPA Finished Cement Grinding.

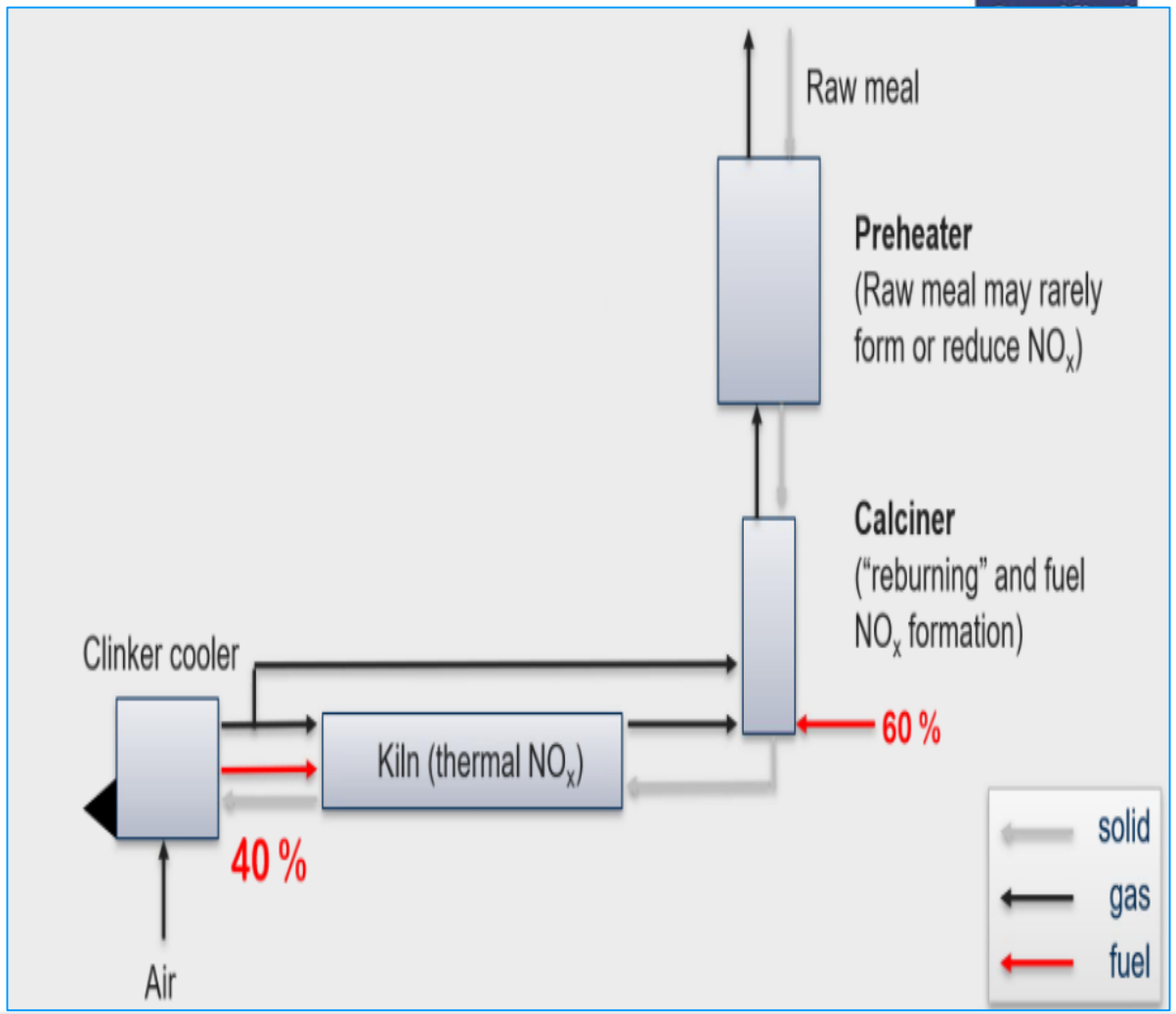
J K Cement Muddapur is certified with ISO 14001, ISO 9001, ISO 45001 & ISO 50001:2018 . GreenCO Gold rating Plant & Great Place to work certified company

Background



Main Factors affecting NOx

- High Combustion Temperature
- High O2 Concentration
- High residences time at high temperature



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Project Overview

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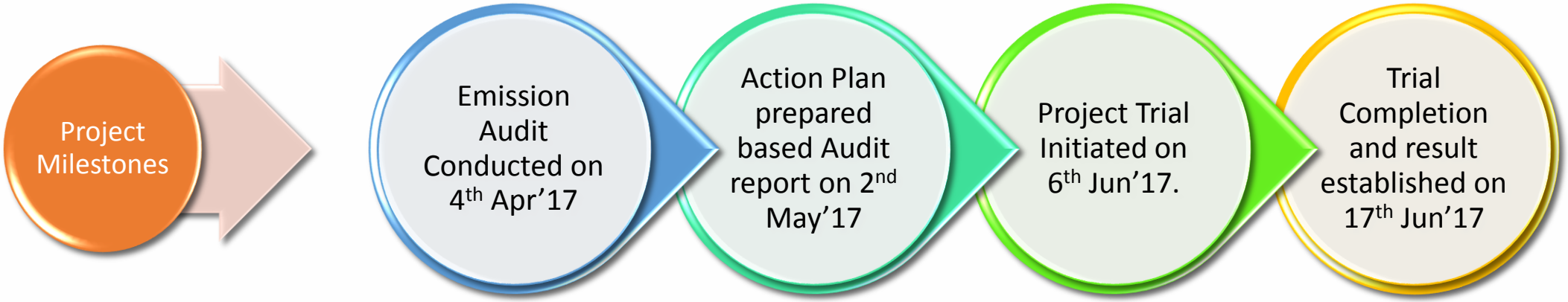
Project title	Kiln Chimney NOx Reduction by Hot Bottom Formation
Trigger	As a Responsible Corporate, we are striving to Work for Sustainable Solution to fulfill the environmental norms predominantly NOx emission below 800mg/Nm^3 This particular Project is discussed and implemented under the guidance of our top management.
Uniqueness	First kind of Project in India ever initiated by any Cement Industry. No major modification required in Existing Setup supplied by FLS low NOx Calciner



Working Principle

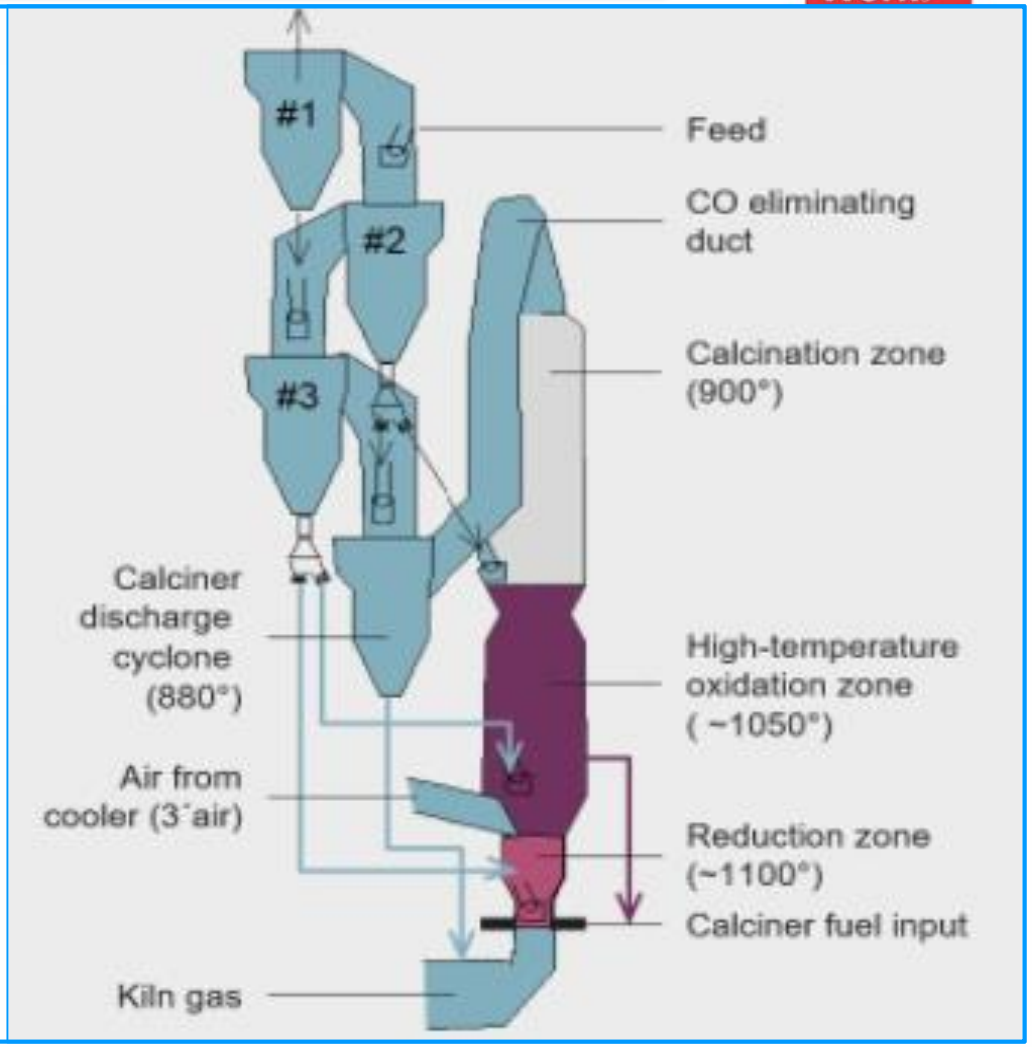
Principle behind the Project :

- $CO + NO \rightarrow CO_2 + \frac{1}{2}N_2$
- $5H_2 + 2NO \rightarrow 2NH_3(\text{or } N_2) + 2H_2O$
- $CH_i\bullet + NO \rightarrow HCN$: "$CH_i\bullet$" is a hydrocarbon radical where i = 1,2,3
- $4NH_3 + 6NO \rightarrow 5N_2 + 6H_2O$
- $2HCN + 4NO \rightarrow 3N_2 + CO_2 + CO + H_2O$

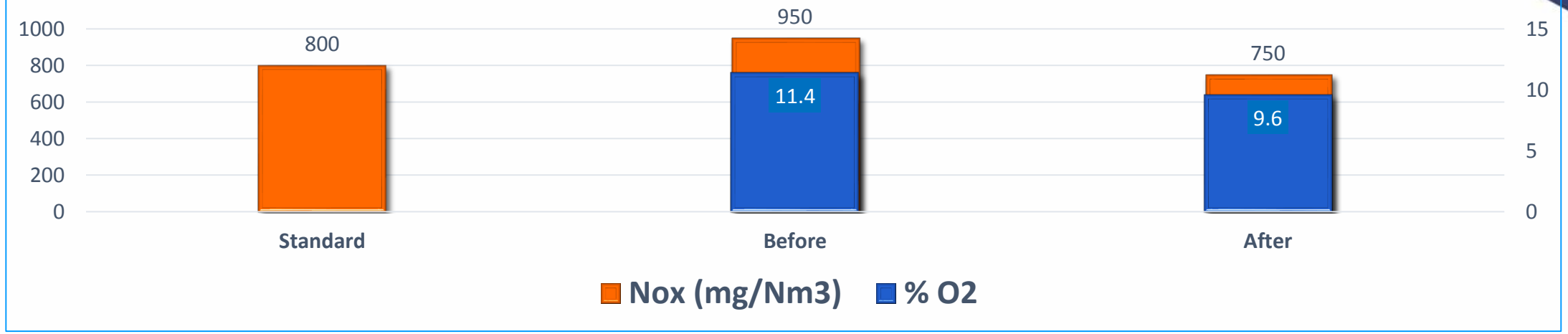
Reaction 1&2 promoted in Reducing atmosphere and using Raw Meal as the catalyst.

Reaction 3 is favored by high temperatures.

The byproducts NH3 and HCN can further reduce NOx.



Tangible Benefits

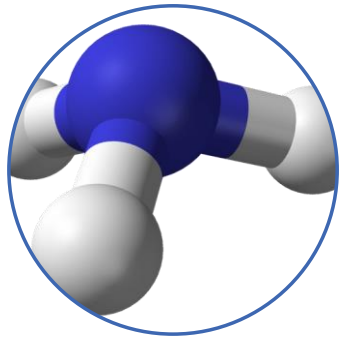


Parameters	Before Hot Bottom	After Hot Bottom
% O_2	11.40	9.26
Average NOx in mg/Nm3 @ 10 % O2 dry basis	950	750
Reduction in NOx %	21 %	

Intangible Benefits

Full CO burnout and stable operation.

Flexible Choice of Fuel.



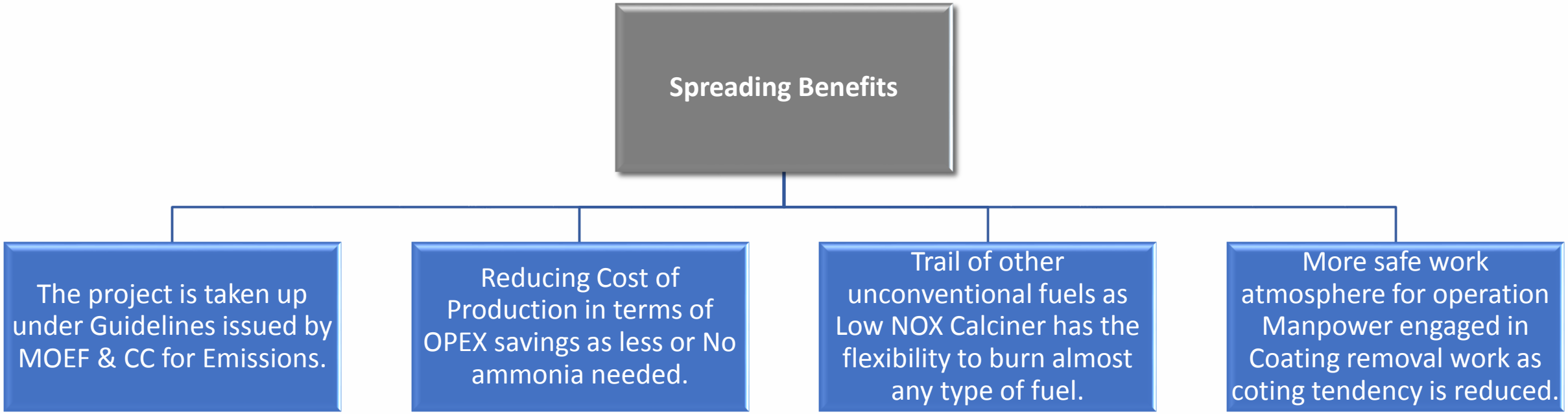
Less Ammonia consumption as reduced operation time of SNCR.

Optimized for Alternative Fuel.

Reduced build-ups and less cleaning

Replication Potential

Replicability: 100% replication potential in Cement Sector for all Dry process Inline Calciner Kilns.



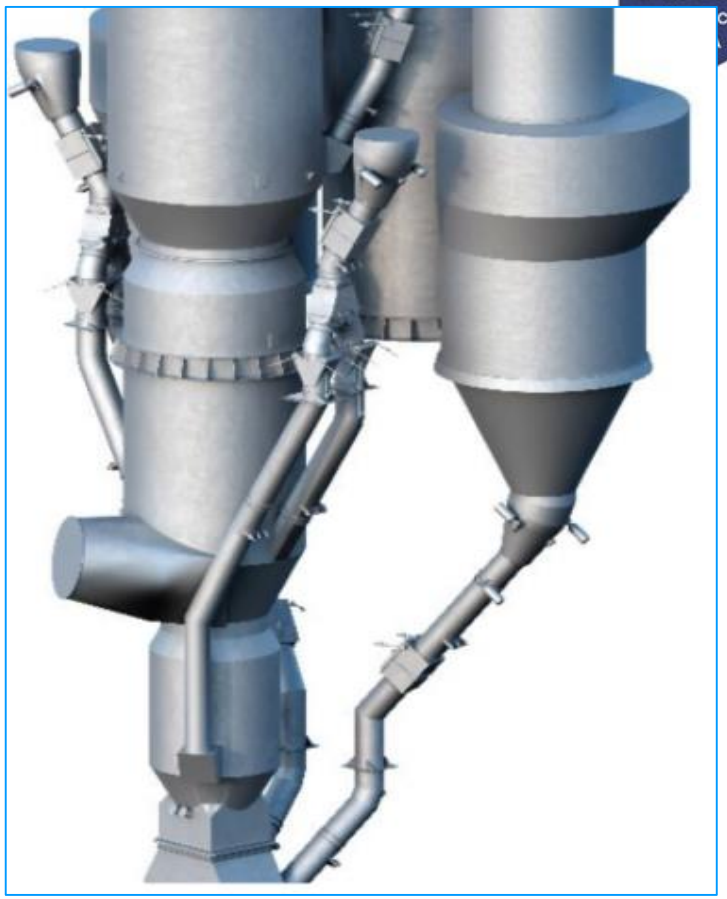
Replication Potential within Sector

In Cement Sector, replication of the Project is highly beneficial in terms of CAPEX, OPEX savings and compliance of Environment norms.

The plants which are not having the technology supplied by FLS can also go for it by opting following technique:

- Retrofitting of the existing system can be possible.
- One firing location, one meal split, one air stream tangentially to the Calciner
- Creating the Hot zones and reduction zones.

The Project is showcased in various events e.g. CII Energy efficiency award, Production and Refractory Summit at JK Cement Muddapur etc.



Challenges

SN	Challenges	Remedial Action
1	Frequent jamming of Stage Four cyclone feed pipes.	Shock blasters provided to eliminate the Feed pipe jamming.
2	Refractory Failures in Calciner Hot Bottom zone.	Existing Refractory replaced by high temperature bearing refractory.
3	Uneven build-ups in Calciner.	Tangential meal inlet provided for cold walls to prevent build ups
4	Variation in Degree of Calcination	Adjustment of Meal Dispersion Plates

National benchmarks/Standards

As per the MOEF & CC guidelines, NOx emission limit for the new Kilns are 800 mg/Nm3.

This project is a new benchmark project.

As the part of its Environment policy, JK cement Muddapur is complying the all norms regarding the emissions.

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 9th May, 2016

G.S.R. 496(E).—In exercise of powers conferred by Sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, Namely :-

1. (1) These rules may be called the Environment (Protection) Fourth Amendment Rules, 2016.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules, 1986 in Schedule I, for serial number 10 and the entries relating to SO_2 and NO_x , the following shall be substituted, namely:-

S. No	Industry	Parameter	Standards		
(1)	(2)	(3)	(4)		
"10.	Cement Plant (without co processing), Standalone Clinker Grinding Plant or, Blending Plant		A – Emission Standards (i) Rotary Kiln –without co processing		
			Date of Commissioning	Location	Concentration not to exceed, in mg/Nm³
			(a)	(b)	(c)
		Sulphur Dioxide (SO_2) in mg/Nm³	Irrespective of date of commissioning	Anywhere in the country	100, 700 and 1000 when pyritic sulphur in the limestone is less than 0.25%, 0.25 to 0.5% and more than 0.5% respectively.
		Oxides of Nitrogen (NO_x) in mg/Nm³	After the date of notification (25.8.2014)	Anywhere in the country	(1) 600
			Before the date of notification (25.8.2014)	Anywhere in the country	(2) 800 for rotary kiln with In Line Calciner (ILC) technology. (3) 1000 for rotary kiln using mixed stream of ILC, Separate Line Calciner (SLC) and suspension pre-heater technology or SLC technology alone or without calciner.

(i) The timeline for implementation of emission standards for all the parameters i.e. Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x) and Particulate Matter (PM), with respect to Rotary Kiln without co-processing shall be up to the 31st March, 2017.

(ii) The emission standards for Sulphur Dioxide (SO_2) shall be reviewed after a period of five years from the date of notification of these rules.

(iii) The word "NO_2" shall be substituted by "NO_x" wherever it occurs in the notification vide G.S.R. 813(E) dated 25th August, 2014."

Priority plans on fast track

+1 year Plans:

- Increase thermal efficiency
- Fuel mix optimization.
- Reduction in Primary and Transport Air.
- Process optimization to run the plant on optimum level of oxygen.

+2 years Plans:

- Increase co processing of AFR up to 25% TSR.
- Uses of RDF in Kiln Primary burner.

Top ten best practices

Top ten best practices which will form the core of approach for +1 and +2 years:

- Rigors monitoring of Process Parameters
- Process optimization to improve thermal efficiency.
- Arrest of leakages throughout the system to minimize the false air entry.
- Analysis of the impact of various Fuels
- Brainstorming among the cross functional teams.
- Promotion of KAIZEN activities
- Proving solving by using RCFA technique.
- Exploration of new kinds of Alternative fuels.
- Ensuring zero harm by providing Standard Operating Procedures, Do's & Don'ts and Tool box talks.
- Launch of Manufacturing Excellence drive: Utkarsh

JK Cement LTD.

Major Learnings

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- Opex Savings can be achieved as less or no ammonia injection needed for due to lower NOx emission from Low NOx Calciner
- 100% Primary mitigation of NOx can be achieved.
- High temperature Calciner bottom works for all types of fuels
- Better Combustion of fuels with High O2 concentration whereas low NOx can be maintained.

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JK SUPER CEMENT BUILD SAFE | JK SUPER STRONG BUILD SAFE | JK SUPER STRONG BUILD SAFE Weather Shield | JK WHITE CEMENT | JK CEMENT WallMaxX White Cement Based Putty | JK CEMENT ShieldMaxX Universal Waterproof Putty | JK CEMENT GypsoMaxX Premium Gypsum Plaster | JK CEMENT TileMaxX | JK CEMENT PrimaxX White Cement Based Primer