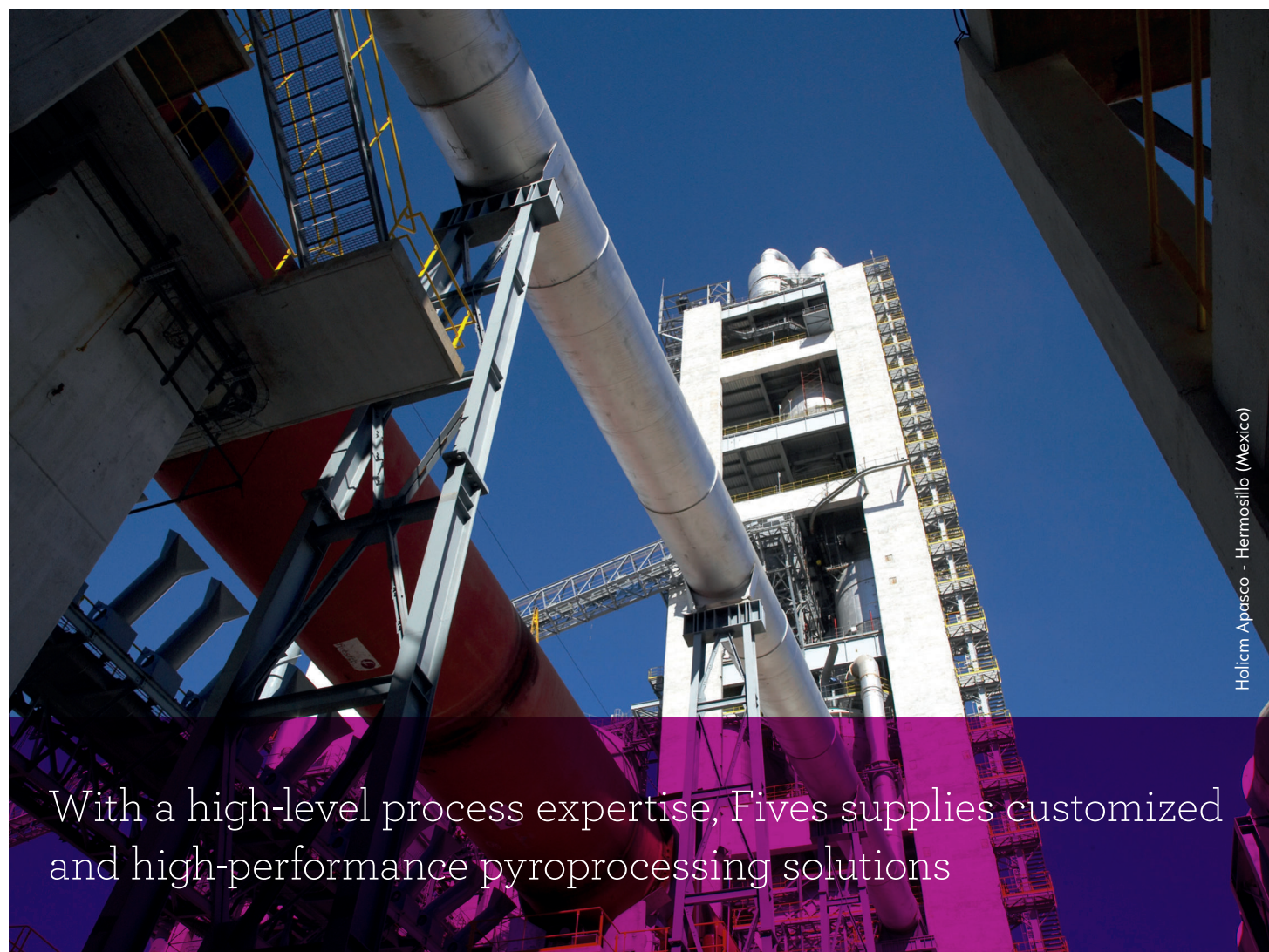


PROCESS  
TECHNOLOGIES

CEMENT & MINERALS

# FCB Pyroprocess systems

Wide range of highly flexible solutions



Holcim Apasco - Hermosillo (Mexico)

With a high-level process expertise, Fives supplies customized and high-performance pyroprocessing solutions

Complete burning lines and calcining solutions integrating proprietary equipment that provide:

- Heat efficiency
- Low pollutant & CO<sub>2</sub> emissions
- Maximized alternative fuels use
- Stable & optimized operation
- Energy savings

## FCB Preheater: High efficiency & low pressure drop cyclones

- Fan power reduction
- High heat transfer efficiency
- Very stable operation
- Minimized heat and energy consumptions
- Reduction of dust load to filter

Less than **450** daPa pressure drop over a 5-stage preheater



## FCB Kiln: A proven and reliable rotary kiln



- Reliable tires fastening system that minimizes shell deformation and improves brick lining lifetime.
- Girth gear linked to kiln shell by flexible ties and oil lubricated pinion and gear assembly with a very reliable paddle wheel system.
- Friction drive with auto aligning supports for two-piers kilns.
- Water-cooled roller stations equipped with:
  - Swivel bearings at each end to follow the kiln movements,
  - Main Mettal® bushings which accept high loads.
- Kiln seals based on FCB design to ensure an efficient tightness. Downstream seals equipped with nose ring cooling system.

## FCB Chlorine bypass

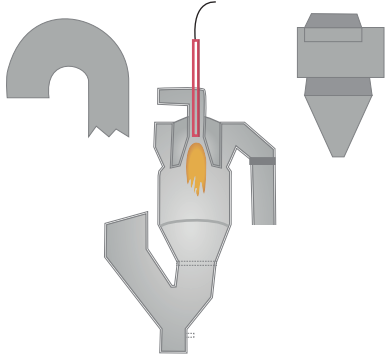
- Kiln fumes bypass extraction performs a strong quenching of the gases with fresh air. It can be followed by hot filtration (400°C) or by a second cooling step before a bag filter (below 240°C). Fives has installed bypass systems in many cement plants, where extraction rates range from 8% to 50%.
- It is possible to recycle high NOx content gases to the clinker cooler to avoid emissions to the atmosphere.

### Go Smart

- Kiln mechanical status monitoring for predictive maintenance
- Remote technical assistance
- Process optimization system: FCB Opti-Kiln™ with operation parameters dashboards

## Fives designs customized precalciner solutions to meet specific customers' needs

### FCB Zero-NOx Preca



**Low-NOx emissions:** Thanks to staged combustion and depending on the fuel mix, FCB Zero-NOx Preca does not produce any NOx. Thus, in many cases, it avoids the use of an SNCR injection system.

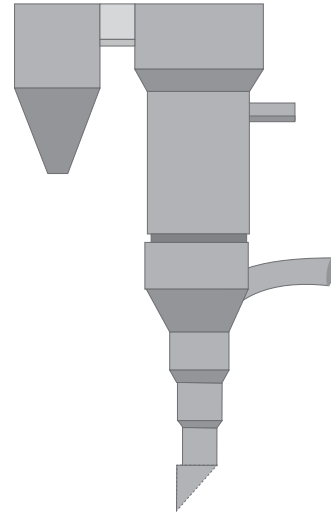
**Low burnability fuels capabilities:** The Low-NOx burner creates a hot spot for easy ignition and complete burnout of any fuel such as anthracite coal, petcoke and some alternative fuels.

**Staged combustion:** The conical quarl of the combustion chamber stabilizes ignition in reducing conditions, which avoids the production of NOx.

**Tertiary air damper:** Dampers with vertical axis are air-cooled for high temperature above 1000°C.



### FCB In-line Preca



**High flexibility of fuels mix:** FCB In-line Preca can process medium size alternative solid fuels, even with high humidity content, up to 100% substitution ratio.

**Reduced emissions:** The staged combustion leads to very low NOx emission levels with or without SCR and a staged meal introduction leading to hot temperature zone and no CO generation.

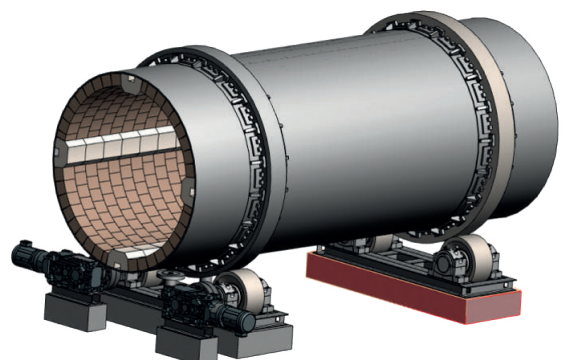
**Optimized gas distribution/micro-mixing** leading to efficient combustion and perfect heat transfer.

## + FCB Preca-Max®

- In-line combustion chamber for coarse alternative fuels
- 100% substitution rate
- High flexibility in terms of fuel type and size – up to 400mm in 3 dimensions
- Less alternative fuel preparation leading to great savings

FCB Preca-Max® allows for processing a wide range of coarse solid alternative fuels

Up to **400 mm 3D**



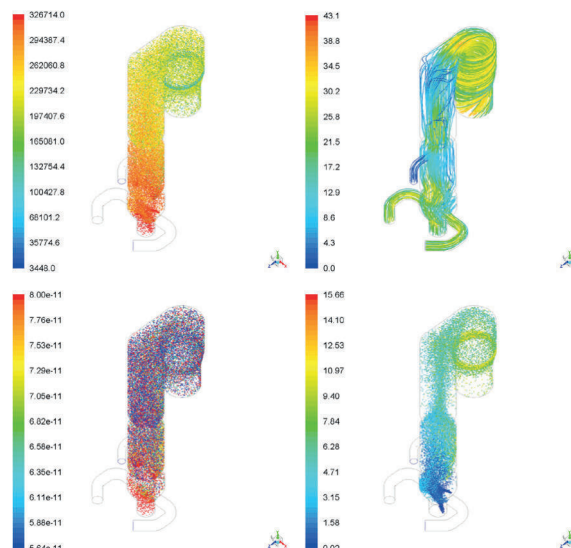


From process design and equipment supply to complete turnkey execution, Fives delivers all types of projects, either greenfield, brownfield or modernization

## Process expertise combined with a broad knowledge in mechanics

Adequate sizing of the equipment for pyroprocessing requires a **full and perfect knowledge** of the raw meal characteristics and behavior.

Fives has developed laboratory methods well adapted to the evaluation of raw materials, using DTA and TGA measurements. Pilot scale models and 3D flow calculations are carried out to design and optimize Fives equipment. **In-house CFD models** are developed for simulating complex and interacting chemical reactions and fluids dynamic.



CFD modelisation of Precaliner (fuel, meal and gas)

## Customized services of trials, tests, analyses and samples

Thanks to its in-house Research and Testing Center dedicated to Cement and Minerals, Fives supports its customers well in advance in their projects through:

- Sizing and characterization of materials behavior within state-of-the-art laboratories
- Reliable and predictive process and material testing in real conditions on our semi-industrial pilot plants
- Production of small samples quantities for their own studies and qualification process



FCB Flash Calciner Pilot Plant



Research and testing center - France



Chemical laboratory



Crushing and grinding pilot plant

# FCB Flash Calciner, a 3 steps comprehensive solution

1

## Raw material grinding/drying

A dedicated mill and classifier for increased fineness and drying with hot gases from the preheater outlet

2

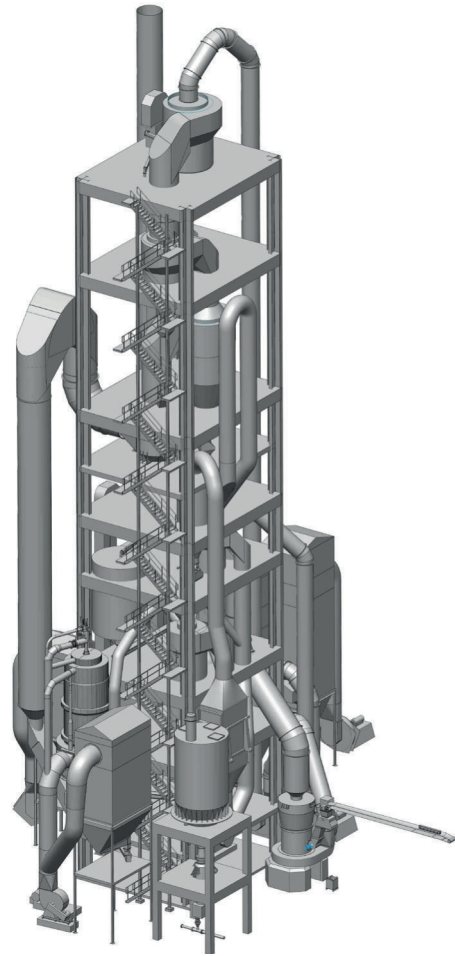
## Preheating and calcining

Based on indirect firing providing an optimum temperature control and the possible use of alternative fuels or any other energy sources

3

## High-efficiency cooling with color control

Through low pressure drop cyclones



## Patented color control system for clay calcination

Color control is made thanks to a reducing atmosphere. The operating principle consists in dissociating the reduction phase from the calcination allowing high level of alternative fuels.

## Integrated gas treatment

Efficient pollutants neutralization with optimized reagent consumption is done through: dry scrubbing (lime injection) to reduce SOx emissions, Regenerative Thermal Oxidizer system to treat VOC & HC and active coal injection to capture heavy metals and dioxins.

## Main advantages compared to rotary kiln solution

- Faster warm-up
- Accurate temperature control
- Lower energy consumption through heat recovery
- Lower maintenance needs
- Compact footprint
- Lower CAPEX for new plants

## Get Green\*

- High thermal efficiency
- Air pollution control system
- High alternative fuels usage
- Substitution of clinker by calcined clay

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With over 85 years of experience in industrial engineering and contract execution, Fives has proven operational excellence in dealing with major pyroprocess projects worldwide

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## More than 141 references worldwide



### Fives FCB

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