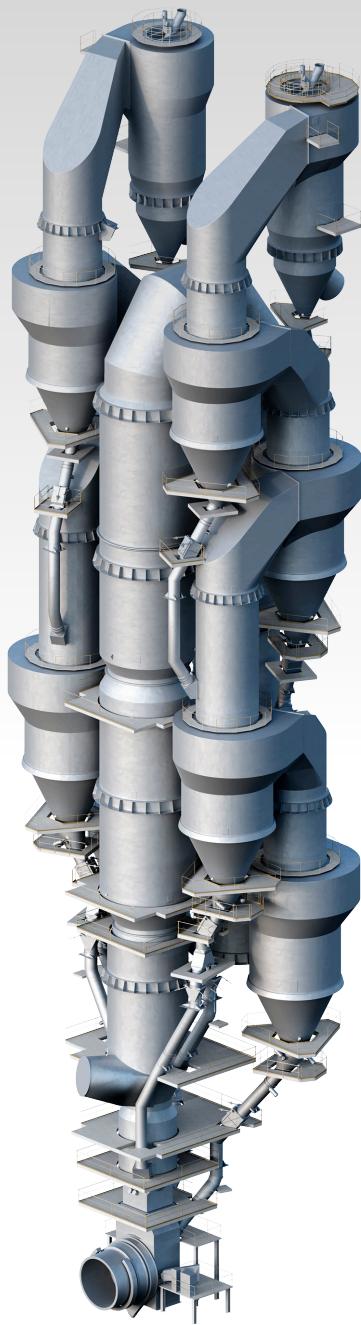


**FULLER**<sup>®</sup>



# LOW NOX CALCINER

COST-EFFECTIVE AND EFFICIENT NOX REDUCTION

# REDUCE YOUR PLANT'S NOX EMISSIONS

Get peace of mind by achieving your NOx emissions limits. In many cases, without needing ammonia injection. The Low NOx Calciner is our latest and most advanced in-line calciner ever. It's based on extensive research and field experience as well as more than 50 years of helping cement producers lower their NOx emissions. The Low NOx Calciner is suitable for both upgrades and new installations.

## KEY BENEFITS

**01****Low total cost of ownership****02****Efficient NOx reduction****03****No/less need for ammonia injection****04****Flexible fuel choices****05****Reduced build-up and less cleaning**

## Future-proof NOx reduction

Throughout the years, authorities have tightened NOx regulations and this trend is expected to continue. Meeting NOx emissions is, therefore, a key demand for cement producers around the world, not only because NOx-related issues like smog pollution has a direct impact on the local society, but also because your license to operate is directly linked to your NOx emission.

The unique design of the Low NOx Calciner is the result of extensive research where we have combined comprehensive field tests with Computational Fluid Dynamics (CFD) modelling to develop the optimal and most efficient calciner on the market. Its design allows for optimum NOx reduction, minimised wall build-ups and lower operational costs.

## An investment worth making

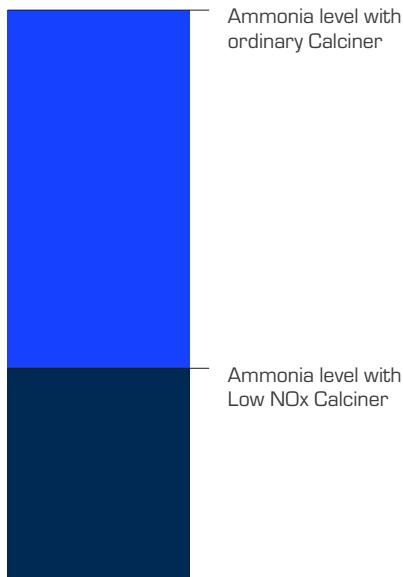
Your investment in our Low NOx Calciner has a significant long-term impact on plant operations. Our experienced engineers work closely with you to ensure the calciner delivers according to your goals.

The Low NOx Calciner is designed for low total cost of ownership. Many cement producers experience that primary NOx abatement techniques, such as those seen in a calciner, aren't always enough to comply with the most stringent NOx emissions requirements. That's why many cement plants use ammonia in their secondary NOx reduction systems like a

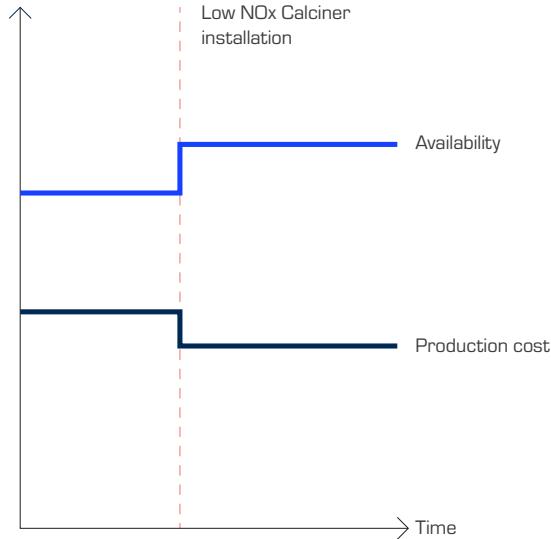
SCR or SNCR system, which can be rather costly. The Low NOx Calciner sets new standards for primary NOx reduction that requires less ammonia injection or even makes it unnecessary.

Build-up of raw meal on the calciner's wall is a well-known issue. It means that calciners require regular cleaning and are more prone to operational shutdowns. Our Low NOx Calciner is designed to avoid this issue by introducing material into the reduction zone and the lower calciner in a unique manner to protect the walls from build-up while maintaining a hot core for excellent combustion and NOx reduction. Throughout the lifecycle of your Low NOx Calciner, we can provide the support necessary to ensure it delivers on its promise. From planning and implementation to maintenance and supply of spare parts, you can rely on expert support from our global organisation, when and where you need it.

Regardless of whether you are planning to build a new plant or upgrade your existing calciner, the Low NOx Calciner offers the best value when compared with any other calciner on the market.



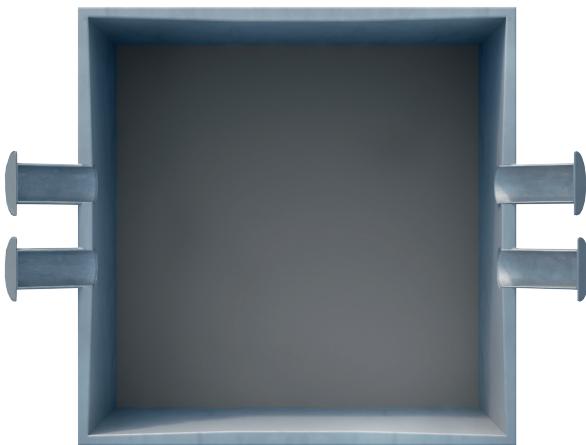
In many cases, our Low NOx Calciner will be sufficient to meet NOx targets without the use of NOx reduction systems. If ammonia is still needed, the amount of ammonia is reduced.



With a goal to optimise production costs, our Low NOx Calciner has been enhanced for operational stability, availability and combustion efficiency.

# DESIGN FEATURES

The Low NOx Calciner is based on our proven in-line calciner technology boasting features that reduce NOx emissions and minimise total cost of ownership.



Multiple fuel inlets ensure optimal distribution between the kiln gases and the fuel.

## How does it work?

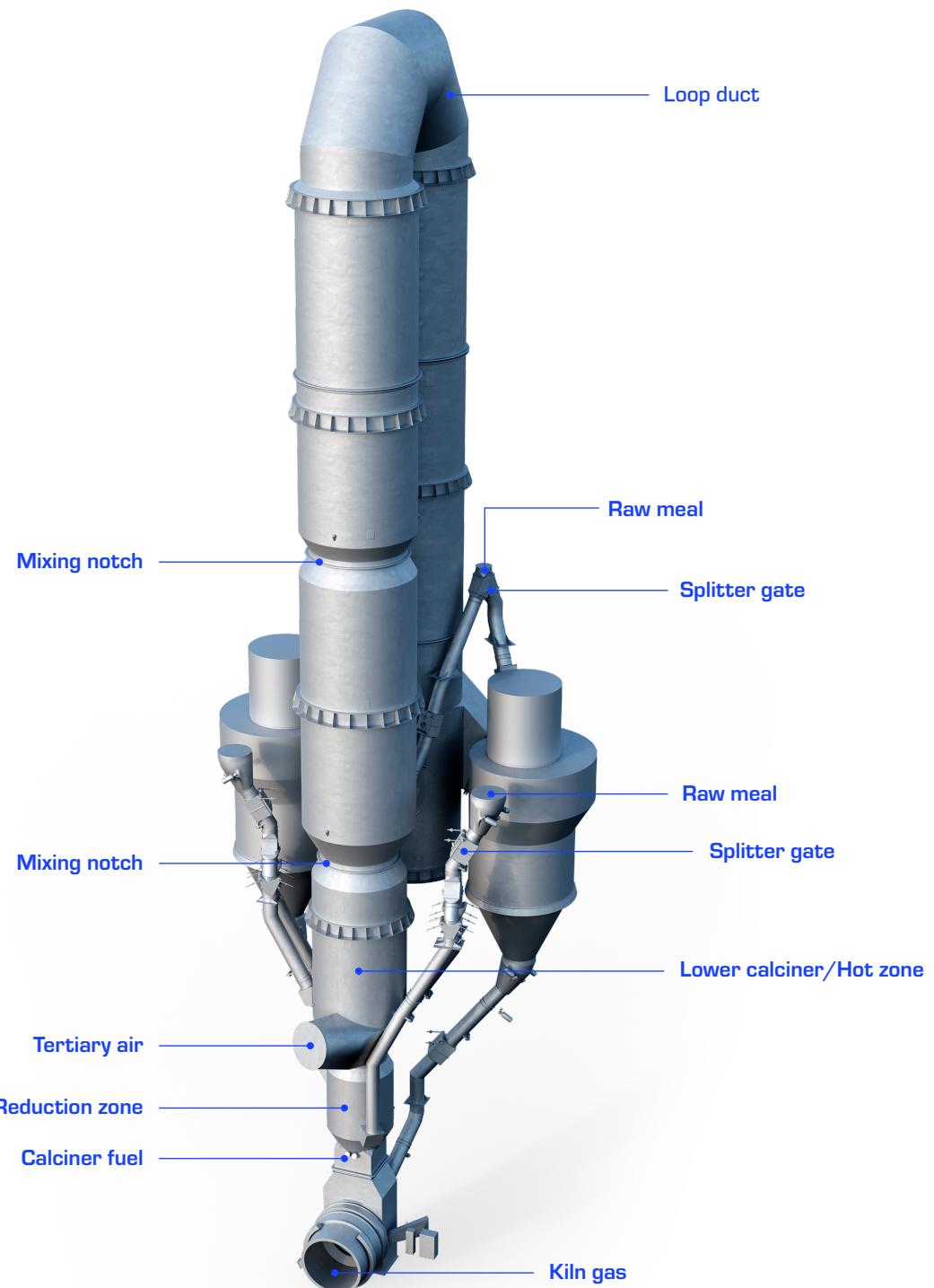
Fuel is injected into the kiln riser below the tertiary air inlet at the base of the calciner. The volume between the fuel inlet and tertiary air inlet has an oxygen deficient atmosphere that promotes NOx reduction. The reduction zone is designed for optimal operation temperatures and adequate gas retention time. The temperature in the reduction zone is controlled by a material split from the second-lowest stage. This material split is also used to prevent potential build-ups in the kiln riser and reduction zone.

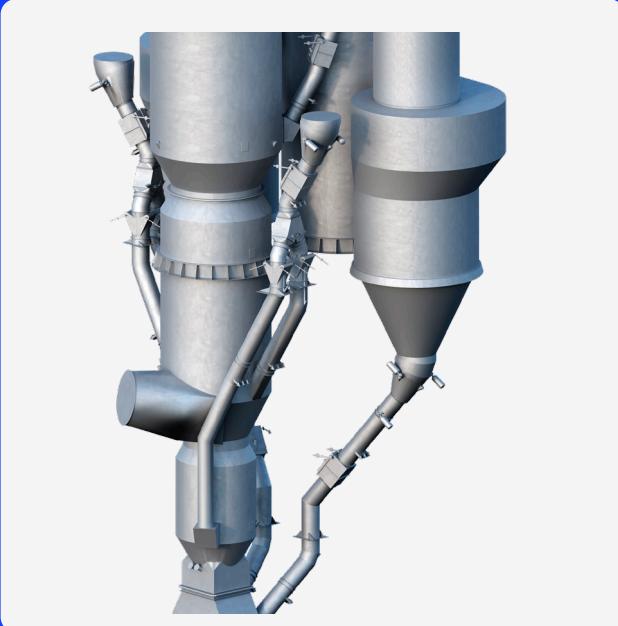
Above the reduction zone is the main calciner vessel, which is divided into two or more sections separated by a notch. The changes in cross-sectional areas create turbulence that ensures effective mixing of fuel, meal and gas, improving heat transfer and combustion. The calciner outlet loop duct ensures optimum gas retention time, further mixing and completing fuel burnout.

## Multiple fuel inlets

To achieve the best distribution between the kiln gases and the fuel, there are multiple coal inlets (4 or 6 depending on plant size). Better fuel distribution provides optimal mixing, which gives the highest average cross-sectional temperature without any build-up problems.

Our Low NOx Calciner is fully flexible as it burns almost any type of fuel. This includes traditional fuels like coal and natural gas, more difficult-to-burn fuels such as petcoke, and most solid and liquid waste fuels. All of these fuel types are burned while achieving low NOx and CO emissions.

**LOW NOX CALCINER**



For optimal NOx reduction and minimised wall build-ups, the reduction zone has a round design with two raw meal inlets.

#### Reduction zone and meal inlets

The round design of the reduction zone with two raw meal inlets is the result of extensive Computational Fluid Dynamics (CFD). This provides the optimum design to simultaneously maintain a cool outer wall and hot inner gas core. All build-up and maintenance cleaning costs are minimised while the highest possible average temperature in the core for optimal NOx reduction is kept.



The unique design of the lower calciner optimises dispersion of the raw meal into the gas stream.

#### Lower calciner

Based on field experience and CFD modelling, the design of the lower calciner optimises dispersion of the raw meal into the gas stream. An optional meal split allows the bottom section of the calciner to operate as a hot zone, further improving combustion and lowering NOx emissions when burning difficult-to-burn fuels such as petcoke or solid waste fuels.