



CALCINER SYSTEM FOR CLAY ACTIVATION

Improve your productivity and reduce CO₂ emissions

CLAY IS WIDELY AVAILABLE, EASY TO CALCINE AND OFFERS BOTH COST AND SUSTAINABILITY BENEFITS

There are many reasons why producers are pursuing projects for clay activation. Some need to increase production at an existing plant and are attracted by the lower capital investment compared to a new clinker line.

Others are looking for a new source of additives as slag and fly ash are becoming increasingly scarce. In some regions, there is a need for new capacity but inadequate limestone. For them, one practical solution is to invest in a clay calciner system and supplement with imported clinker and a finish mill system.

KEY BENEFITS

**Lower operating costs:
materials, fuel, and power**

Lower capital cost

Lower CO₂ emissions (> 30%)

**More environmentally friendly and
sustainable product**

*As compared with clinker production

Reducing the clinker factor

The cement industry has made significant progress towards sustainability goals with alternative fuels and efficiency projects. But CO₂ emissions from the calcination of raw mix in the production of clinker are much harder to mitigate.

One way to tackle this is to reduce the clinker factor with supplementary cementitious materials (SCM). Calcined clay is a cost-effective, sustainable alternative with significant SCM potential, replacing up to 40% clinker and eliminating up to 40% of CO₂.

Our clay calciner system has been specifically developed to fulfil this potential, while maintaining the high strength and quality standards of cement.

WHAT GENERATES THE CO₂ IN THE CEMENT PROCESS?

7%		POWER SUPPLY
37%		BURNING FUELS HEAT GENERATION (COAL, COKE OR GAS)
56%		RAW MIX EMISSIONS (HIGH-TEMPERATURE CALCINATION)

Calcined clay produced in a flash calciner can replace 30 – 40% of clinker while maintaining quality

What you get from FLSmidth

- Comprehensive testing with our laboratory and pilot plant
- State-of-the-art calciner technology
- Full start-up and operational support
- Clinker substitution up to 40%
- Quality product with colour similar to cement
- Training
- Local service and support

KEY BENEFITS FLSMIDTH CLAY CALCINER SYSTEM

<p>Quality product with colour similar to cement – higher substitution rates</p>	<p>Lower capital & operating costs</p>
<p>High system availability and low maintenance costs</p>	<p>More environmentally friendly sustainable products</p>

With our full service laboratory, we'll make sure you have the right materials and the optimum process

We will help you confirm that you have a suitable clay source as well as the right equipment design to process it. Our laboratory testing services includes full chemistry and mineralogical composition as well as clay reactivity analysis. A pilot scale system is also available to produce calcined clay in a larger scale to allow a full quality and strength test of the blended cement product if desired.

Colour control to maintain the cement grey

By applying the right settings and conditions during activation and cooling, we have developed a unique, patent pending process to achieve the standard grey cement colour in your clay. This ensures end users will be happy with the look of the product, as well as its performance.



Colour control with flash calciner
Comparison with and without colour control



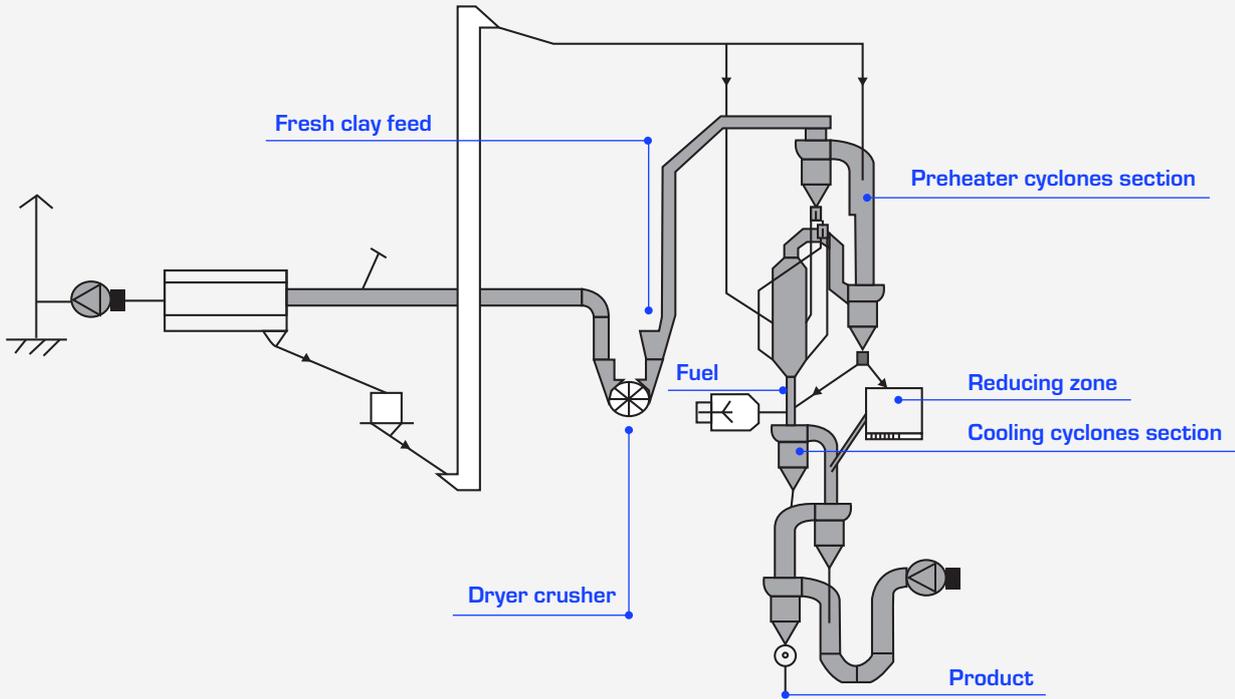
Pilot Installation for SCM pyroprocessing -
At FLSmidth R&D Center Dania, Denmark

Pilot test facility

Versatile pilot system to make activated clay, including:

- Flash calciner string with temperature range of 600 – 1000 °C, residence time of 0.5 – 1.0 second and feed rate 25 – 100 kg/h
- Fluidized bed principle reduction vessel for colour control
- Cyclone cooler string where temperature profiles can be controlled (by preheating cooler inlet air)
- Gas compositions, e.g. O₂ concentrations can be controlled by mass flow controllers.
- Surface loss compensated by electrical heaters

FLSMIDTH'S CLAY CALCINER SYSTEM - PATENT PENDING



Tailored calciner system.

Optimised substitution rates

Clay is a naturally occurring material found almost everywhere around the world. With the right treatment, many clays can make a perfect SCM and can be used to replace up to 40% of the clinker in your product. But to get the full benefits, you need the right process and the right technology.

Our clay calciner design is based on years of research and development and combines the best available technology of the mining and cement industries to optimise clinker substitution while maintaining cement quality.

The process begins with the dryer crusher, which is specially designed for materials like clay with up to 40% moisture content.

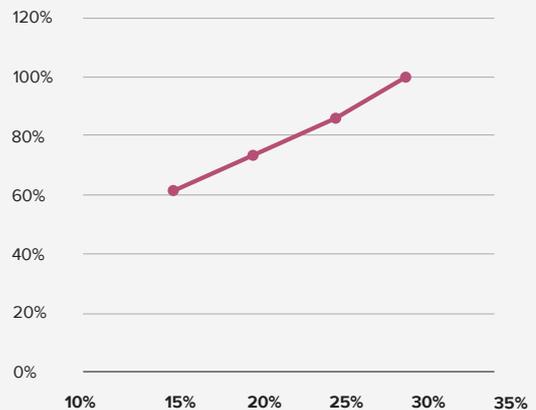
Using waste gases from the preheater, materials are dried and crushed in one operation, achieving both the required fineness and a moisture content of just 1% by the time the clay exits to the preheater. As illustrated in the graph, the clay feed moisture content has a dramatic impact on fuel consumption.

Flexible, efficient fuel consumption

Our efficient calciner system minimizes fuel consumption, maximizing the recuperation of heat from the product.

Any fuel type typically used in a traditional clinker system - including waste fuels - can be fired in the calciner.

IMPACT OF CLAY MOISTURE ON FUEL CONSUMPTION



After the dryer crusher, material is fed to the 2-stage preheater/calciner system where the clay is preheated and the calcination takes place. Fuel is fired in the calciner to perform the clay calcination with an external air heater supplied for start-up or supplemental heat as needed.

A cyclone at the outlet of the calciner separates the gas and material. The calcining temperature and atmosphere can be tightly controlled. This allows for consistent activation, resulting in uniform product quality and emission control. Furthermore, because the stable process delivers a highly consistent product, you can substitute more clinker as compared to activated clay produced in a rotary kiln.

After the activated clay is collected in the bottom stage, it is transported to a reducing zone where a small amount of fuel is injected to maintain colour control of the final product. Without colour control the product will be reddish in colour instead of grey – limiting the amount of clay that can replace clinker in the cement product.

After the reducing zone, the activated clay is introduced to a series of cooling cyclones to attain a final product temperature in the range of 100-120°C. Fresh air is introduced to the bottom-cooling cyclone, and cools the clay as it goes through the series of cyclones. As the clay cools, the air is heated.

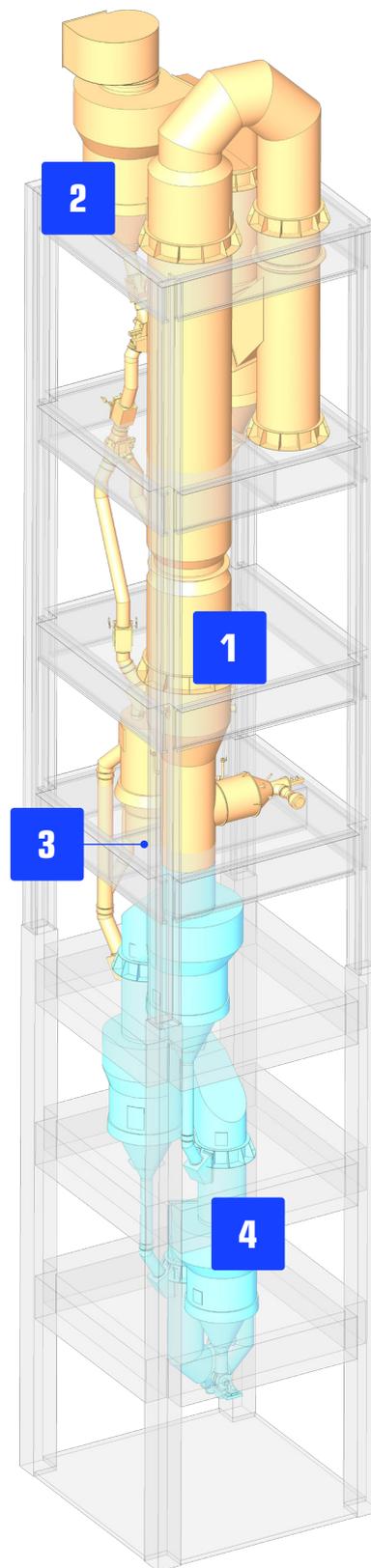
The heated air is then taken to the calciner as combustion air. This helps recover much of the heat from the activated clay and results in a significant fuel savings as compared to designs that use water cooling.

FLSmidth’s calciner design is well proven with a number of references in the Mining industry for processing aluminium.

Retrofitting an existing kiln

If you need a new line, a clay calciner system is the best investment. However, if you have an unused kiln available, it may make sense to convert it due to the lower capital cost. We can help you evaluate the best option for your site.

CLAY CALCINER PREHEATER LAYOUT



1	CALCINER
2	PREHEATER CYCLONES
3	REDUCING ZONE
4	COOLING CYCLONES

You can activate clay in a rotary kiln – but the results simply aren’t as good.

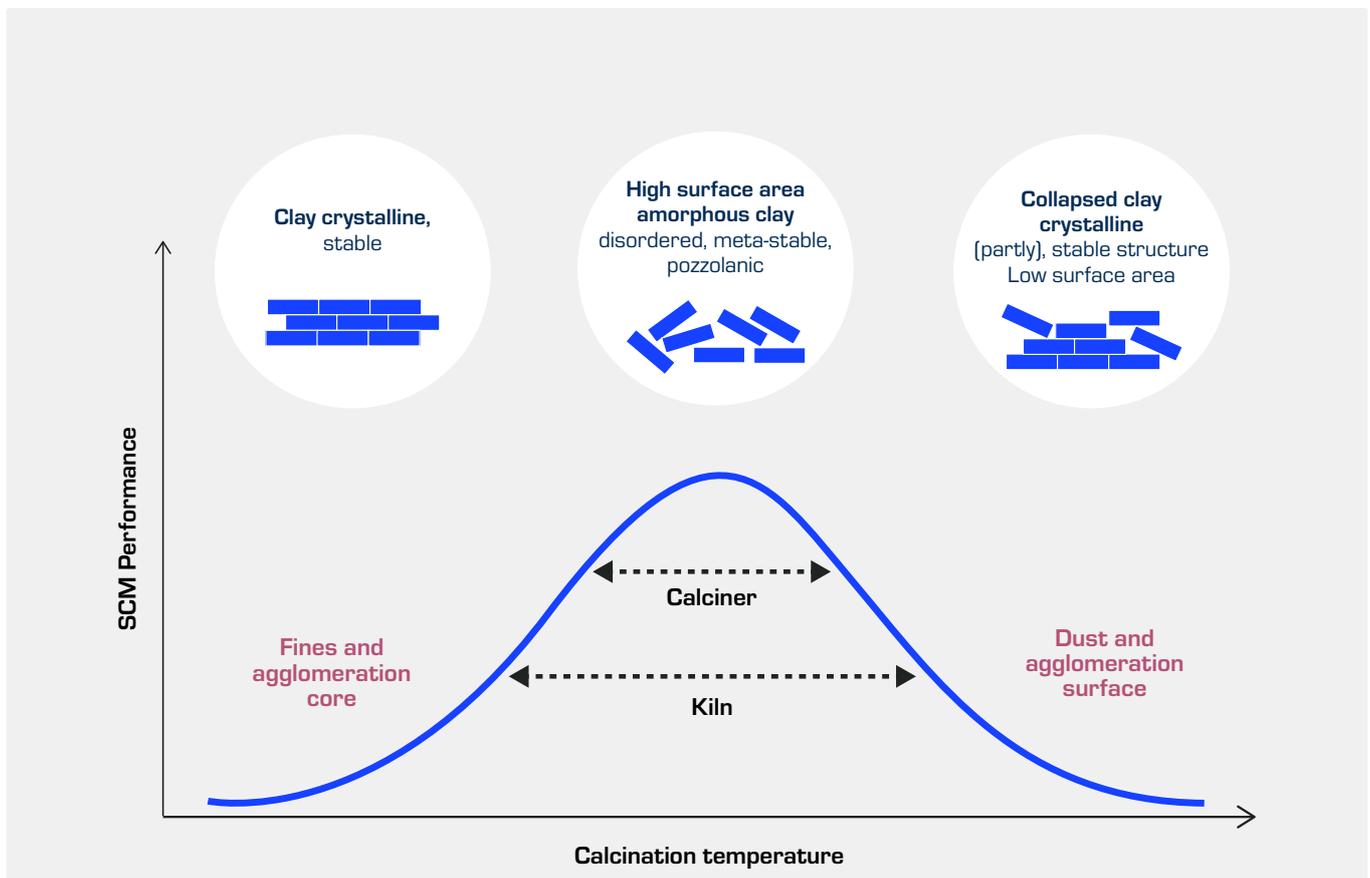
With our clay calciner, you have much better temperature control and more efficient heat exchange. As a result, our calciner system is more energy efficient, with a fuel consumption that is more than 20% lower as compared to a rotary kiln.

You are also able to produce a highly reactive clay that can substitute up to 40% of clinker. Thus, you gain the large CO₂ reduction for the finished cement. In contrast, clay activated in a rotary kiln system is less reactive and only typically allows 15 – 25% substitution.

Benefits of a calciner vs a kiln to activate clay

- Higher quality product due to more consistent calcination
- Higher mix percentage of calcined clay into blended cement
- Lower fuel and maintenance costs
- Greater fuel flexibility for burning waste fuels
- Smaller footprint for a new system
- Lower capital cost for a new system

CLAY ACTIVATION IN A KILN VERSUS A CALCINER



FLSMIDTH CEMENT

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