FLSMIDTH CEMENT

ECS/ProcessExpert®

Advanced process control for kilns and coolers

ECS/ProcessExpert SOLUTIONS FOR PYRO PROCESSING APPLICATIONS

Expert process control of your kiln and cooler improves process stability, even when using high rates of alternative fuels, for higher production and consistently high clinker quality.

KEY BENEFITS

Up to 7% increase in production

Up to 7% reduction in specific fuel and power consumption

Up to 40% reduction in process and quality variation

Up to 2.0% reduction in overall CO$_2$ footprint

Minimum 10% increase in green fuel use and corresponding NOx reduction

WHY ADVANCED PROCESS CONTROL?

An unstable pyro process is a headache that leads to inefficient production and inconsistent clinker quality. But controlling a cement kiln is also a challenge. And a challenge that is becoming increasingly complex, as plants pursue ever higher alternative fuel substitution rates within strategies to lower the carbon impact of cement production and control spiralling fuel costs.

Our latest ECS/ProcessExpert control software assists plant operators in handling these challenges, delivering a more stable and efficient pyro process. It does this by continuously analysing process conditions in the kiln and cooler and then making precise process adjustments that ensure performance targets are consistently achieved. These adjustments are made far more frequently and reliably than any human operator could.

The result is increased clinker production at a much more consistent – and consistently high – quality. Unwanted conditions, such as cyclone blockages and kiln ring formation, are also reduced.

FLSmidth: the process knowledge experts

We are a global leader in the construction, maintenance, and optimization of cement plants. We also have more than 50 years' experience of plant automation, installing thousands of control systems and laboratory systems worldwide. So, when it comes to designing and implementing advanced control automation solutions in the cement industry, there's no more expert a partner.

Designed by our team of cement process experts specifically for cement applications, our ECS/ProcessExpert software brings all this knowledge and experience together to deliver a solution that reliably enhances the capabilities of our customers' plants. Whether that's on cost, sustainability, productivity, quality – or all the above.

THE CHALLENGING WORLD OF CEMENT PYROPROCESSING

Normal control conditions: achieving stability

ECS/ProcessExpert control software initially operates in normal control mode, during which operating conditions in the preheater, kiln, and cooler are stabilised – a prerequisite for optimisation. This stabilisation process uses a range of key performance indices, including burning zone indicator, kiln operation stability index, and kiln heat consumption index, to develop an optimum control stabilisation strategy that incorporates corrective actions to fuel injection, kiln feed, kiln speed, cooler grate speed, and fan speed. The result is stable temperature control in the calciner, stable burning zone conditions in the kiln, stable cooler operation, and consistent clinker quality.

Optimisation control: delivering results

When the process has been stabilised, ECS/ProcessExpert software will move to optimise the pyroprocess by operating as close as possible to the limits. This includes monitoring and keeping free lime close to target by regularly adapting the burning zone indicator target. The software also monitors the lime saturation factor (LSF) in the kiln feed and calcination degree to adjust the calciner temperature target. The software thus ensures no over burning of the clinker and reduces fuel consumption with minimised risk of off-spec clinker.

Upset conditions: ensuring a quick return to normal

In the event of upset conditions, ECS/ProcessExpert software reacts quickly to ensure a smooth and fast recovery to optimised conditions, for example, by reducing kiln feed and speed in the event of a coating fall or changing ID and main baghouse fan speeds to handle gas pressure changes caused by a stoppage in the raw mill. Other examples of upset conditions include high preheater exit CO, cooler bed build-up, and disruption to the kiln fuel feed.

Emissions control

Emissions control is critical to ensuring cement plants operations are compliant with local environmental regulations: any deviation can have serious consequences. The ECS/ProcessExpert software can be easily customized to plant-specific requirements, such as emissions control using ammonia injection, to ensure emissions always remain within allowable limits.

Controlled parameters

- Kiln feed, speed and fuel (including alternate fuel)
- Calciner fuel (including alternate fuel)
- ID fan speed
- Cooler grate and fan speed

Monitored parameters

- Kiln and preheater gas analyser measurements (O_2, CO)
- Kiln burning zone temperature
- Kiln torque and kiln NOx
- Cooler pressure and temperatures
- Burning zone filling degree
- Calciner temperature
- Quality parameters like free lime and calcination degree
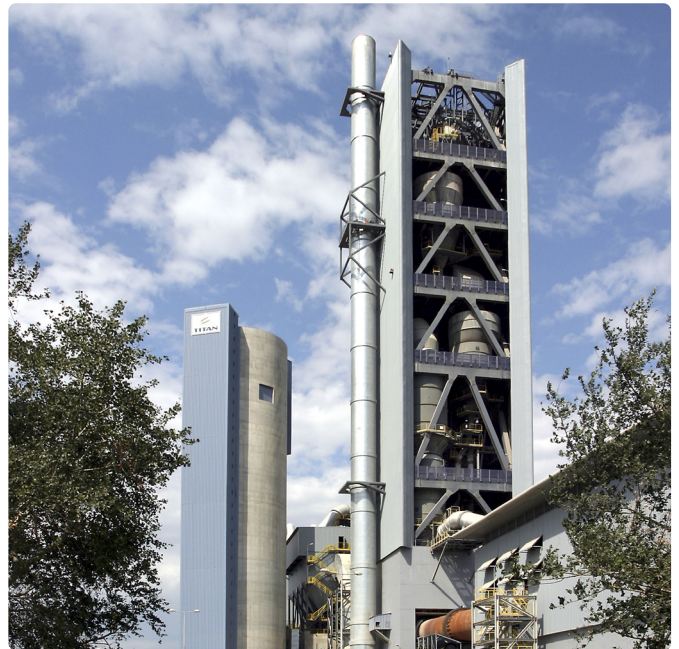
FUEL DISTRIBUTION APP

With plants focused on cost control and carbon reduction, more are using alternative fuels in both the kiln and calciner. Although these fuels are cheaper and help lower CO_2 emissions, they create additional challenges for kiln operation due to their variability in calorific value, moisture content, and chemical composition. Which is where the ECS/ProcessExpert fuel distribution app comes into play.

Fuel optimization control

The fuel distribution app ensures the best possible mix of available fuels based on cost and heat value, without compromising stability or quality. This is achieved using a predictive technique to handle fuel feeder constraints and dynamics, while minimising combustion disturbances in the kiln. The results speak for themselves: the fuel distribution app ensures a consistent total heat value is delivered at the lowest possible cost, while allowing up to a minimum 5% increase in thermal substitution rate.

Upset conditions control

Multi-fuel operations are always vulnerable to a sudden drop in one or more fuels. ECS/ProcessControl software handles this by quickly compensating with other available fuels.

ECS/ProcessExpert fuel distribution app

Controlled parameters

- Ratio between fuels

Monitored parameters

- Fuel costs
- Fuel feeder or environmental limitations
- Current feed rate of different fuels

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