FULLER®

ECS/PROCESSEXPERT

Advanced process control for ball mill circuits

ECS/PROCESSEXPERT SOLUTIONS FOR BALL MILL CIRCUITS

Expert process control of your ball mill circuit ensures you meet demand for maximum production with minimum power consumption and minimal variation in quality.

KEY BENEFITS

Up to 5% increase in production.

Up to 5% reduction in mill specific power consumption.

Reduce process and quality variability by up to 30%.

Minimal change-over time between product recipes.

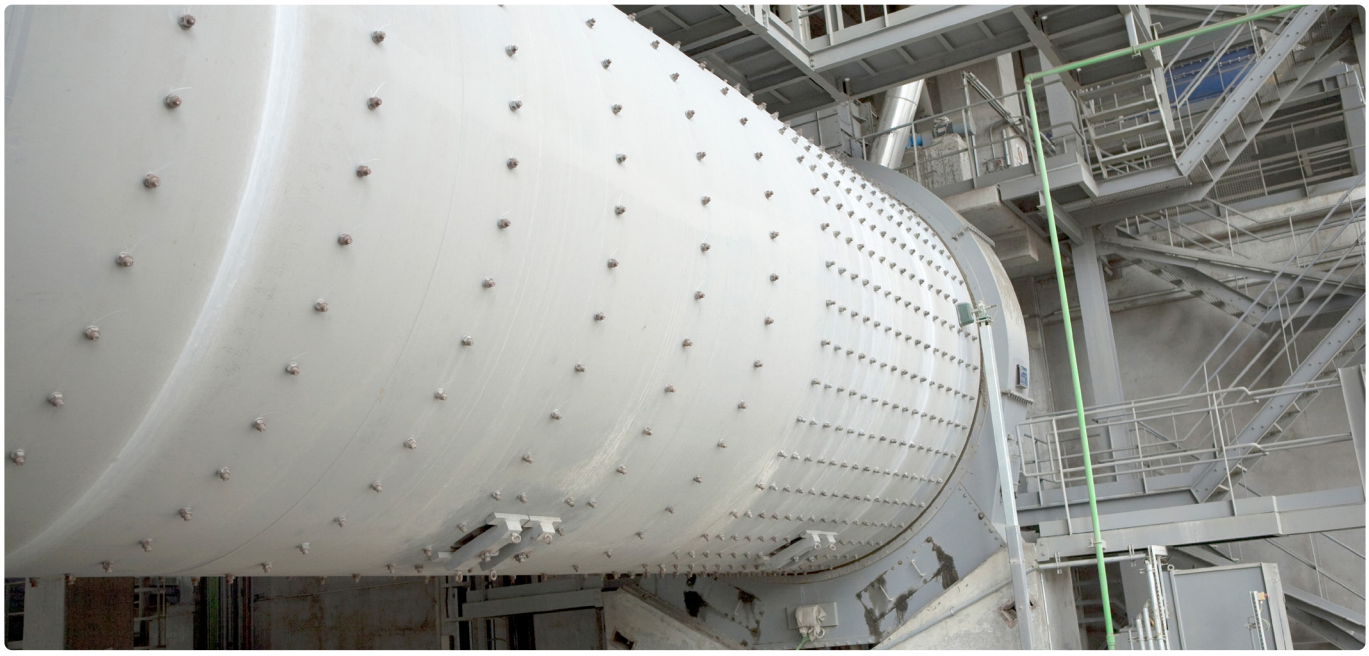
Extend equipment life and cut maintenance costs.

WHY ADVANCED PROCESS CONTROL?

Ball mill grinding consumes a large amount of energy. Optimising ball mill circuits thus plays an important role in reducing both the carbon intensity and costs of cement production. It also improves product quality and reduces variability.

To obtain these benefits, however, conventional PID loops are insufficient as they do not handle process delays (such those caused by fineness analysis and material transport) well. The grinding process also contains internal couplings: for example, the separator speed impacts not only product fineness, but the mill filling level through the reject flow. A change in one of these PID loops may cause disturbance in the other, resulting in conflict, with consequent disruption to and inefficiency in the grinding process.

Our ECS/ProcessExpert software eliminates these challenges via an advanced multi-input multi-output (MIMO) control strategy using a model predictive control (MPC) technique. It is thus able to achieve best possible grinding efficiency – and all the benefits that brings.



Fuller: the process knowledge experts

We are a global leader in the construction, maintenance, and optimisation 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.

EFFICIENT GRINDING. GUARANTEED.

Normal control conditions: achieving stability

In a conventional closed circuit grinding plant, the main control parameters are separator speed and fresh feed. ECS/ProcessExpert software frequently calculates new set points for these two parameters based on minimising the cost function, which is defined as the minimum deviation from production targets and minimum changes to separator speed and fresh feed. Weighting of target factors is used to prioritise between objectives. This results in more stable operation, reduced energy consumption, and increased production.

The next step: mill optimisation

When operational stability is achieved, the ECS/ProcessExpert ball mill application moves to optimise mill operation. It does this by automatically adapting the targets for mill folaphone/power and elevator power, while ensuring Blaine or fineness targets are met. This results in highest possible throughput and quality for any given recipe.

Upset condition control

In the event of a mill jamming, the software responds quickly to ensure rapid recovery to optimum operating conditions, reducing the feed rate and monitoring the mill until conditions are restored. If a process measurement is declared invalid (due to hardware failure, for example), the controller automatically replaces it with second priority signals or estimated values to continue operations. Temporary measurements can also be selected manually by the operator when a device is taken down for maintenance.

Automatic recipe handling

When the ball mill is responsible for producing different types of cement, it's important that change-over between blends is achieved quickly and efficiently. To facilitate this, ECS/ProcessExpert software includes a library of user-defined pre-set cement recipe definitions and configurations. The operator then only need select the correct recipe number and the software will manage change-over automatically.

Controlled parameters

- Feed and fineness control by fresh feed and separator speed
- Feeder ratio control for quality
- Mill draft
- Water flow
- On-line process state estimation

Monitored parameters

- Product quality, such as Blaine, SO_3, LOI.
- Separator and fan speed
- Fresh and reject feed
- Mill folaphone/power or elevator power
- Draft and temperature
- Feeder response to a given setpoint

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