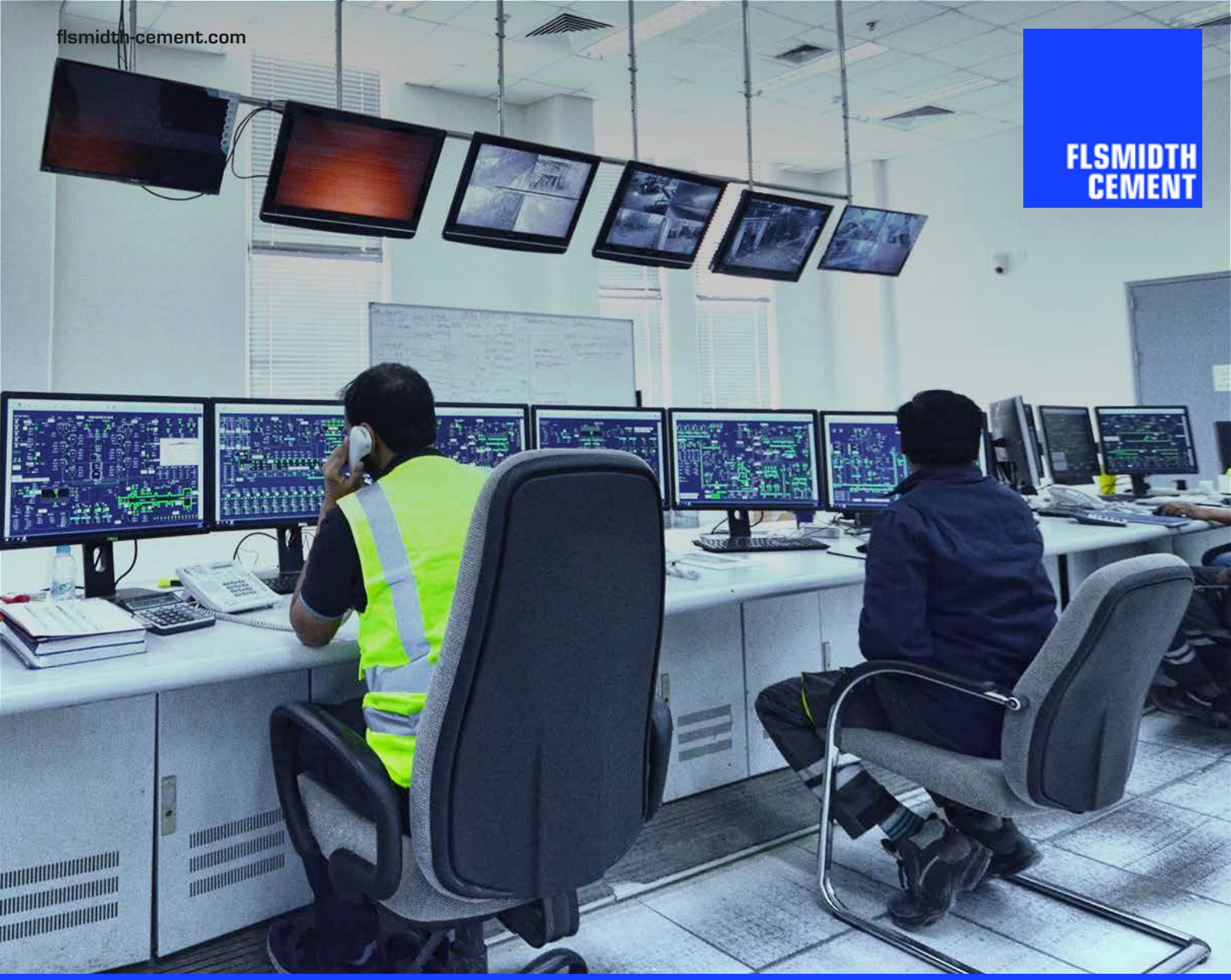
flsmidth-cement.com

FLSMIDTH CEMENT



BROCHURE

ECS/ProcessExpert® SOLUTION

Advanced process control for the cement industry

ECS/ProcessExpert SOLUTIONS FOR INTELLIGENT PROCESS CONTROL

Our proven control software improves process stability and productivity to ensure your cement plant performs to its maximum potential.

KEY BENEFITS

Increase production by up to 7%.

Cut fuel/energy consumption by up to 7%.

Lower CO_2 emissions by up to 2% and cut NO_x emissions.

Reduce equipment wear and minimize downtime.

Deliver ROI within a year (depending on application).

Reduce process and quality variability by up to 40%.

WHY ADVANCED PROCESS CONTROL?

Our latest ECS/ProcessExpert control software provides advanced process control and optimization for the cement industry, delivering maximum efficiency and higher profitability. But how exactly does it do this?

The software uses a sophisticated toolbox and specialised application modules to continuously analyse process conditions. Based on this analysis, it makes precise adjustments to the process to ensure performance targets are consistently achieved. These adjustments are made far more frequently and reliably than any human operator could.

The result is unparalleled process stability, optimised production, and more effective management and correction of process disruptions. It also provides powerful support for a plant's sustainability ambitions, whether they be lower emissions, higher thermal substitution rates, or increased use of supplementary cementitious materials. Finally, it reduces equipment wear, improving availability and utilization, while reducing operational and maintenance costs.

ECS/ProcessExpert software is installed on standard PCs and includes a user-friendly graphical interface, as well as advanced alarm and trend capabilities. And it's compatible with most other plant control platforms.

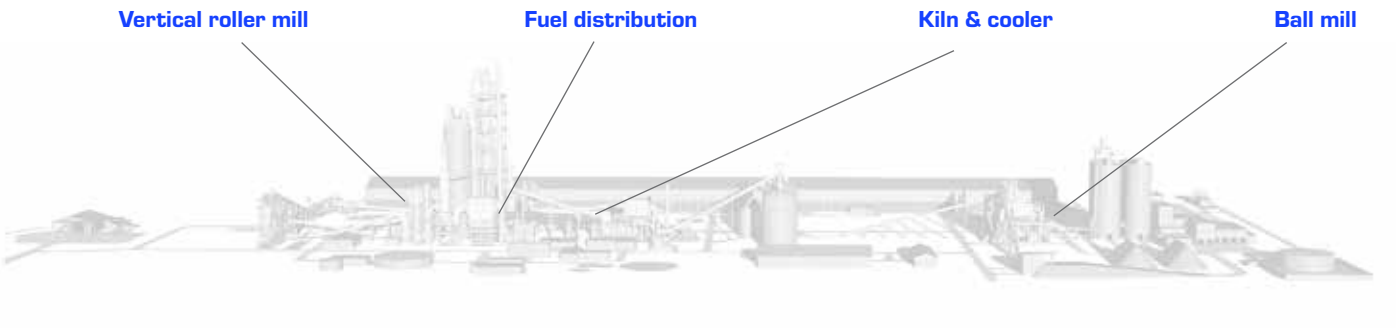
ECS Control Center

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, we are the expert partner.

Designed by our team of cement process experts specifically for cement applications, the 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.

ECS/ProcessExpert® APPLICATIONS



ECS/ProcessExpert® SOLUTIONS ARE AVAILABLE FOR:

Pyroprocess

An unstable pyroprocess is a headache, leading to inefficient production and variable clinker quality. The ECS/ProcessExpert® software avoids these negative outcomes by stabilising kiln and cooler operations, resulting in an increase in production, fewer cyclone blockages, reduced kiln ring formation, and more consistent clinker quality. It also helps lower CO_2 and NO_x emissions.

In addition, a customisable fuel distribution module enables plants to increase alternative fuel thermal substitutions rates (TSR) – supporting the transition to greener plant operations and lower fuel costs. The application ensures the best possible fuel mix, based on cost and heat value to deliver a reliably stable process, however variable the input material.

Vertical roller mills

Vertical roller mills are recognised for their higher efficiency compared to ball mills; however, they operate in a fast-changing, dynamic environment that requires close attention to process conditions. Fully-automatic control via the ECS/ProcessExpert software improves the mill's operating capabilities and efficiency, resulting in a reduction in specific power consumption and tighter control of the mill conditions.

The solution also includes a ramp-up option, to deliver a smooth, controlled start-up of the mill to rapidly achieve process stability and minimise machine wear.

Ball mills

Ball mills are energy intensive machines. The ECS/ProcessExpert software is designed to deliver lower specific power consumption, while ensuring correct product fineness is achieved. It automatically adjusts fresh feed to ensure best-possible throughput and quality for any given cement recipe. For grinding circuits that produce a range of different cements, it also automates the switch between product types, via a range of predefined recipes, for quicker, more efficient changeover.

CUTTING-EDGE TECHNOLOGY

The ECS/ProcessExpert® software builds on the advanced control techniques that we have developed over the past five decades. The result is suite of customisable technologies that allow plant personnel to tailor functions to their unique needs, including:

- Process customised abnormal situation management.
- Process customised operational objectives.
- Priority management of objectives.

Each of the process control applications in ECS/ProcessExpert uses advanced techniques such as self-adaptive control, model predictive control fuzzy logic rules, and user defined program. The system is designed for operation globally and is capable of handling a wide range of challenges, including adaption to plant upgrades and testing of new solution prototypes.

Self-adaptive control

An alternative to traditional model-based multivariable control (MPC), self-adaptive control model-less multivariable process control and optimisation technology incorporates rate-predictive control, which is inherently adaptive and predictive. This makes is well-suited to both linear and non-linear processes, without dependency on detailed process models. Able to evaluate process information in real time, it is more resilient to process changes and able to generate better dynamic predictions.

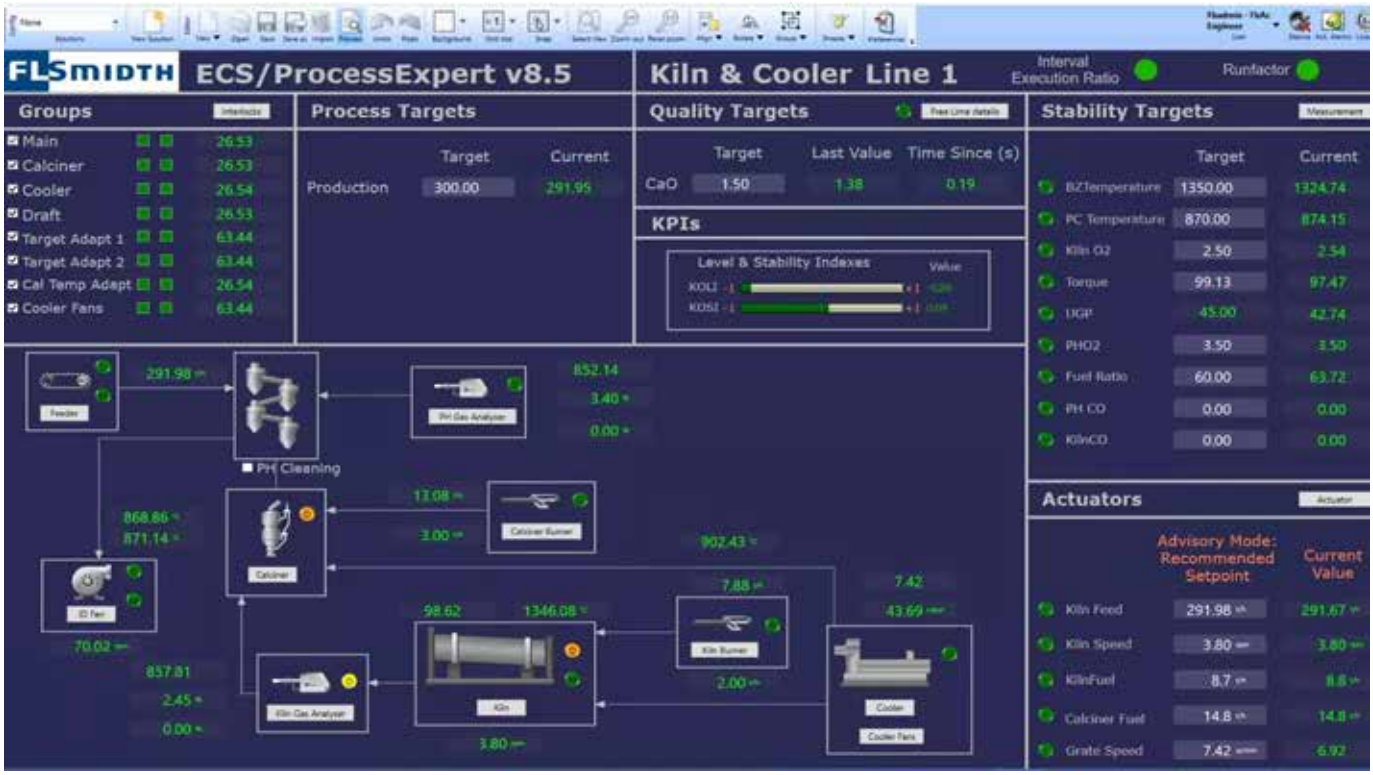
WORK WITH EXISTING CONTROLLERS AND CONTROL SYSTEMS

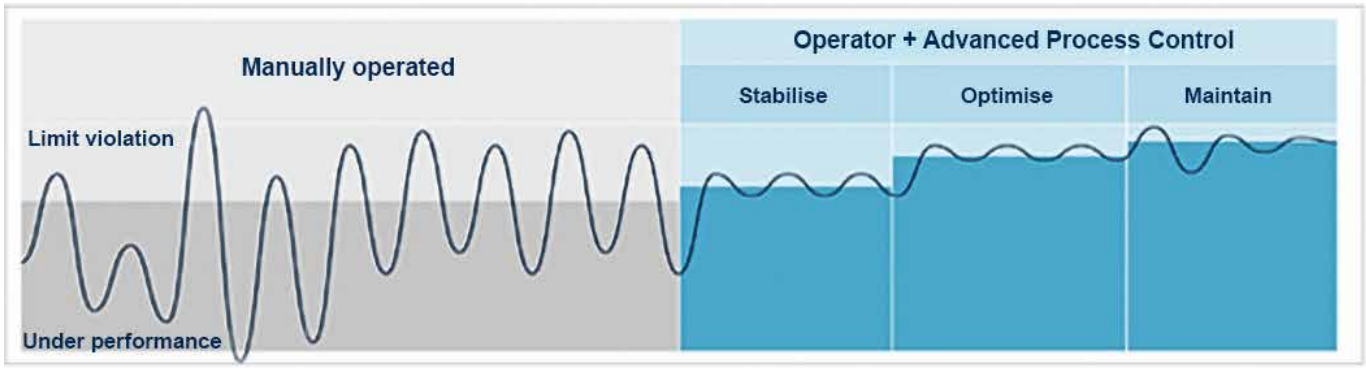
Existing control systems are easily integrated into the ECS/ProcessExpert software with specific I/O drivers for common PLCs, including Rockwell Automation, Siemens, and Schneider. The software also supports industry standard OPC US, enabling integration with most existing control systems.

All measurements are validated before use within the system to ensure data integrity and consistency. Controller behaviour can also be tested in an online environment. Behaviour of all objects in the controller is monitored for different levels of detail to allow easy troubleshooting. For a realistic test of the controller, the designer will often use the built-in PLC communication drivers to perform real-time testing with current process values.

Out-of-the-box features and functionality

- Smart objects: intelligent process objects that integrate process and control engineering knowledge.
- Modelling tool that helps find the process variables and actuators correlating to the model.
- Fuel distribution (pyroprocess) module for controlling the use of alternative fuels in the kiln.
- Module for controlling recipe changes in the raw and finish mills.
- Mill ramp-up facilitates ramp-up of grinding circuits, ensuring nominal production is achieved faster and with less process variability.
- Target adaptation continuously adapts the operational targets to ensure maximum production and minimum fuel/energy consumption are achieved.
- Advisory mode recommends actions to the operators when the system is not in operation.
- Holistic solutions that optimize mill and kiln operation, customized to each plant.
- Decision tree component illustrates the process status and reveals the underlying reasons to the operator.





PXP DataBooks

The latest version of the ECS/ProcessExpert software includes PXP DataBooks, a collaborative framework designed specifically for skilled process specialists and data scientists. PXP DataBooks allows collective development of new AI solutions, which can be deployed into any control strategy in real time. It also facilitates inference of machine learning or deep learning models that have already been trained offline in their preferred environment. Potential uses include (but are not limited to) prediction, anomaly detection, and condition monitoring.

PXP Insights

The standard PXP Insights module creates sustainability-focused dashboards that contextualise system performance in terms of environmental KPIs. It means personnel can see how the process improvements delivered by the ECS/ProcessExpert software – such as lower fuel consumption or higher energy efficiency – translate into lower carbon emissions.

An advanced, Cloud-based PXP Insights module is also available for enterprise-level analysis. Seamlessly integrating with plant-level deployments, it collects and showcases performance data in real time, as well as providing evolution analysis for improved decision-making. It also facilitates easy monitoring and visibility of global operational CO^2 savings achieved by the ECS/ProcessExpert software, as well as benchmarking of individual equipment performance against the group average to highlight areas for potential improvement.

Control loop performance monitoring

Visibility of controller inefficiencies is key to highlighting where to improve control of the main process parameters. Our control-loop performance monitoring tool provides this visibility. It tracks changes in controller behaviour by comparing performance values from different time periods. It then uses these data to detect any degradation in controller performance and to verify that corrective efforts are moving performance in the right direction.

THE KEYS TO SUCCESSFUL CONTROL SYSTEM

For equipment to operate reliably and efficiently, it needs to be implemented correctly. It must then be maintained and operated effectively to ensure the benefits continue to be reaped over the long term. Our eight-step implementation model provides the professional support necessary to ensure the system meets all requirements and expectations.

EIGHT STEPS TO SUCCESS

It begins with a dedicated project manager, who acts as your main contact throughout the lifespan of the project and is involved in all elements of the implementation project. The project manager works within the eight-step model to ensure your ECS/ProcessExpert advanced process control system delivers reliable performance as quickly and smoothly as possible. The model is also designed to ensure the system is maintained correctly after implementation. Our eight-step implementation model comprises the following phases:

01	**Project planning**	The project manager prepares a comprehensive, start-to-finish strategy, outlining all the key information, including phases of implementation, deadlines, project meetings, and more.
02	**Client process interviews**	Our specialists conduct meetings with site personnel to determine the plant's control needs.
03	**Application design and process strategy review**	We design the right solution based on the above interactions.
04	**Primary system commissioning**	Commissioning is completed, and the system is implemented and monitored onsite.
05	**Operator and super-user training**	Our specialist will train the operator and site PXP champion in the new system
06	**Remote monitoring and fine-tuning**	As the final part of the commissioning phase, we make small adjustments to the system, either remotely or onsite.
07	**Handover**	After commissioning is complete, we remote monitor the site and transition to the service phase of the agreement.
08	**Establishing long-term support**	We continue to monitor the system and analyse KPI data, helping support the system and ensure that the plant runs as efficiently as possible.

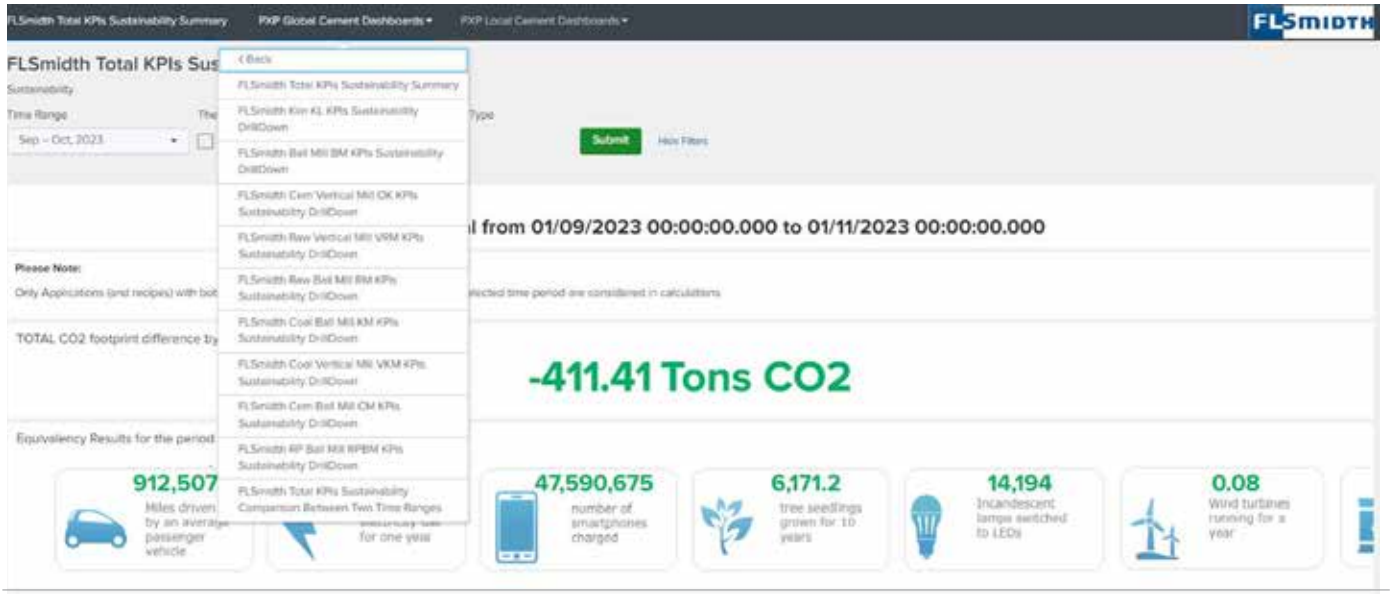
LONG-TERM CUSTOMER SERVICE

Implementation is just beginning of a successful advanced process control journey. To maintain system performance, we continue to evaluate the system and its processes after commissioning is complete via a range of ongoing service offerings.

ECS/ProcessExpert® proactive service agreement

Each ECS/ProcessExpert software installation comes with a one-year proactive service agreement. This comprises remote service visits every two months, plus an annual onsite visit. We also monitor all KPI parameters for the duration of the agreement.

Advanced performance reports are included as part of the yearly service agreement. Data gathered by the ECS/ProcessExpert software is sent to our processing centre at FLSmidth Cement HQ and used to calculate KPIs related to the utilisation and performance of the system. Operating data is reported to help the plant identify the benefits derived from the software, as well as to identify further opportunities for improvement and optimisation.

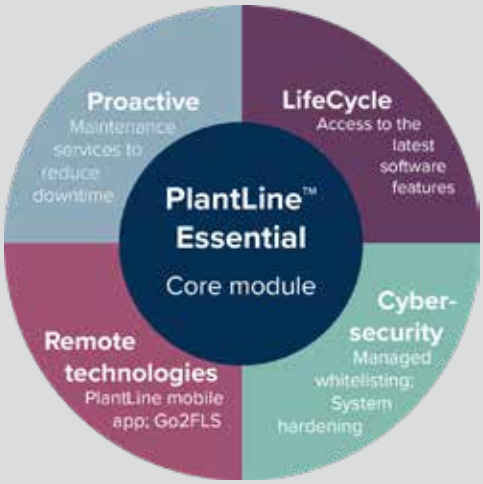


PlantLine™ service agreement

A PlantLine service agreement covers FLSmidth's automation equipment and software. Every agreement includes the mandatory Essential package of services. This lays the foundation for more advanced offerings via four optional service packages: Proactive, Lifecycle, Cyber Service, and Remote Technologies. Each of these packages offers multiple pick 'n' mix services, so you can decide just how much support you need and choose which combination of services to include.

Proactive
Maintenance services to reduce downtime

Lifecycle
Access to the latest software features



Remote technologies
PlantLine mobile app Go2FLS

Cybersecurity
Managed whitelisting system hardening

REMOTE TECHNOLOGY

GO2FLS

Our remote services are well-established, but if you want to empower your team to access control room data remotely, we can help. Our Go2FLS technology enables remote access to the plant's control network for internal plant support and maintenance. Your team can tap into real-time process mimics, trends, diagnostic faceplates, and all alarms/events on the plant's control system, enabling them to be part of troubleshooting efforts, engineering, software maintenance and process optimisation wherever they are.

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