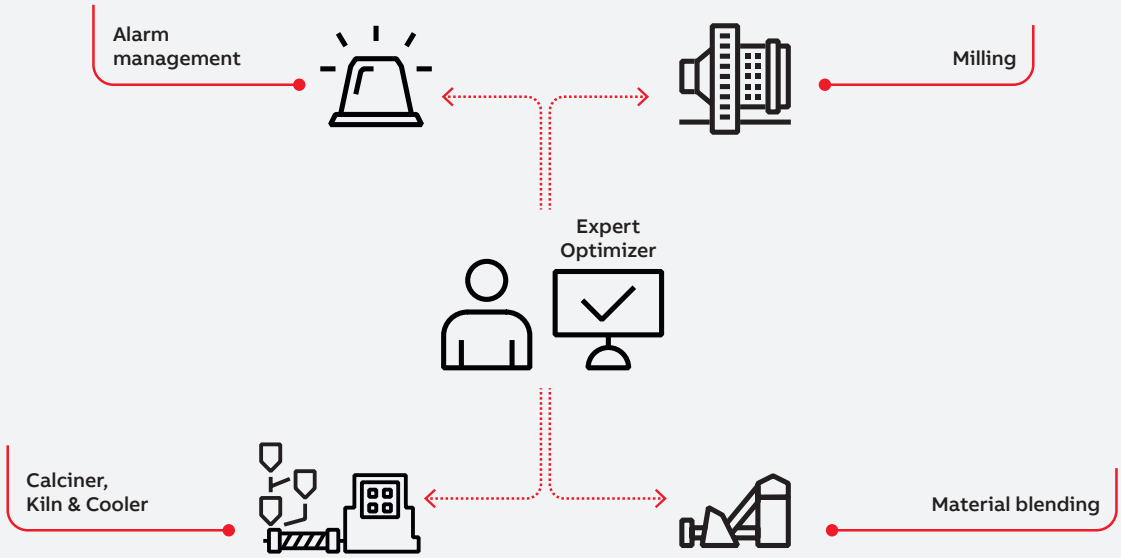
ABB Ability™ Expert Optimizer for cement

Stabilizing productivity, improving sustainability and maximizing profitability



- Up to 5% output improvement
- Fuel consumption reduced by up to 5%
- Electricity use reduced by up to 5%

An advanced process control application that controls, stabilizes and optimizes various cement processes, is helping plant managers achieve profitability and sustainability targets, often with payback in less than six months.

ABB Ability™ Expert Optimizer (EO) is an advanced process control application that uses model predictive control, fuzzy logic and neural networks to optimize your cement plant.
By coordinating the setpoints of the different process stages and immediately detecting deviations within the operations, EO makes accurate and consistent system decisions. It avoids the inevitable variations incurred when performance is controlled manually, thereby minimizing shift-to-shift variations and human workload. This releases operators to focus on other tasks.

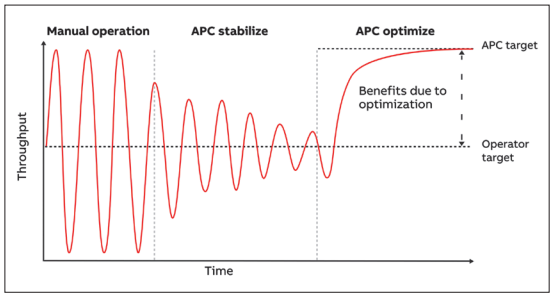
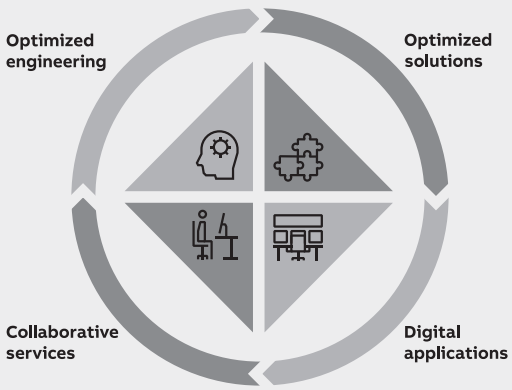


ABB Ability™ Expert Optimizer is an advanced process control application that stabilizes and optimizes various cement processes.

ABB Ability™ CementOptimize
ABB Ability™ CementOptimize is a 4-pillar framework that takes a deep dive into all aspects of a cement plant to identify ways in which to fine-tune and optimize every process, every sensor and device, every application and every service. The four pillars include optimized solutions, optimized engineering, digital applications and collaborative services.
With digitalization at its heart, ABB Ability™ CementOptimize relies on advanced application libraries, software solutions and digital platforms to reduce process complexity while promoting safe and secure production. By ensuring that the right people have the right information at the right time, the cement plant maximizes reliability, productivity and energy efficiency while optimizing planning and visibility across operations and the entire enterprise.
Within the digital applications pillar sits ABB Ability™ Expert Optimizer for cement: an advanced process control technology that helps the cement industry reduce costs and increase yields. It achieves this by optimizing the cement process, from material blending through to the final product. On that journey it minimizes consumables while maximizing alternative fuels and throughput.



Applications

The software modules within EO cover kiln optimization, alternative fuel management, mill optimization and material blending.

Kiln optimization
The kiln process is intrinsically unstable and influenced by long time delays and large perturbations. EO stabilizes the process before driving the key controlled variables to the process limits. EO controls the kiln around the clock, 365 days a year, as effectively as the company's best operator. Depending on the kiln type, EO provides:

- Kiln control module
- Calciner control module
- Cooler control module

	EO off	EO on
Throughput [t/h]	152.0	155.8 (+2.5%)
Specific energy consumption [kcal/kg]	870–880	850–860
EO utilization	–	> 95%

Expert Optimizer applied to a kiln unit in Turkey

Features

- Burning zone temperature optimization
- Combustion optimization
- Alternative fuel maximization

Benefits

- Reduced number of kiln stops
- Increased yield
- Reduced specific thermal energy consumption
- Reduced quality variability

	Unit	EO on
Reduction in temperature variation	Pre-Calciner	31%
Reduction in coal over alternative fuels	Pre-Calciner	58%
Reduction in litric variation	Kiln	41%
Reduction in UGP1 variation	Cooler	43%
Reduction in UGP2 variation	Cooler	30%

Expert Optimizer applied to a pre-calciner, kiln & cooler in Italy

Alternative fuel management
Burning alternative fuels can lead to instability in the clinker manufacturing process. EO controls, mixes and monitors rates of several alternative fuel types to achieve consistent burning, whilst ensuring the kiln does not become unstable due to changes in fuel calorific value.

Features
- Handling of numerous and complex alternative fuel lines
- Uncontrolled and controlled fuels
- Ratio or maximize functionality

Benefits
- Maximum utilization of alternative fuels
- Steady energy input

Mill optimization
Grinding is an energy intensive process and optimizing its efficiency has a significant impact on a plant's energy bill. EO optimizes coal, raw material and finished cement grinding by increasing throughput and securing consistent output quality while lowering energy consumption.

Features
- Mill load and throughput optimization
- Fineness control
- Temperature control
- Handling of mill start-up
- Automatic product type switching

Benefits
- Reduced number of mill stops
- Increased output
- Reduced specific power consumption
- Reduced quality variability

Material blending
Stable and correctly proportioned raw meal is essential for energy efficient clinker production. Correctly blended cement is critical to ensure customers receive a quality end-product. EO helps control raw material and cement blending.

Features
- Mix control with laboratory samples and/or online analyzers
- Additives control

Benefits
- Reduced fluctuations in blended material composition
- Optimized material costs
- Improved kiln operation due to more homogeneous raw material

Integration with ABB Ability™ System 800xA

EO can be integrated directly into ABB Ability™ System 800xA distributed control system (DCS) or as standalone application, connecting to any other third-party PLC or DCS. Integrating directly into System 800xA provides the same usability and interface as the rest of the control system. Cyber security is strengthened while ensuring less hardware to maintain and introducing a common historian and information management system.

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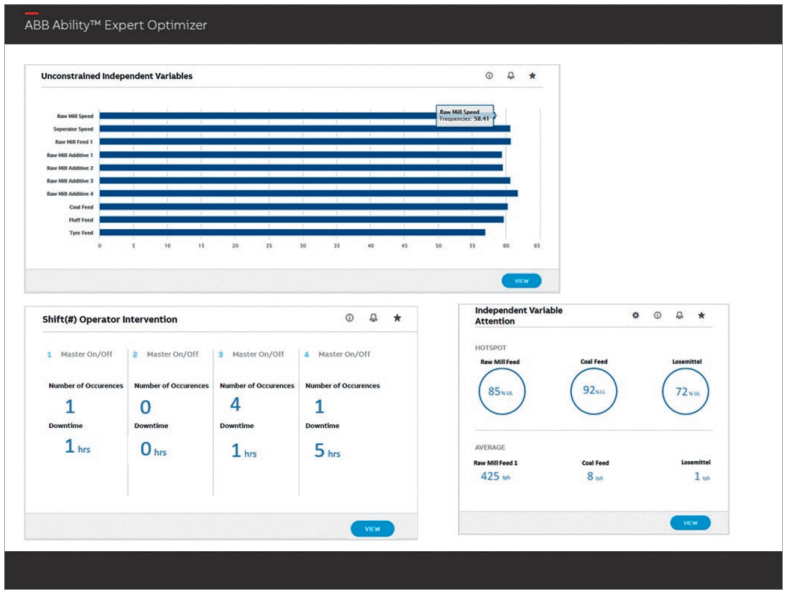
Controller KPI monitoring



The major tools and technologies used are contained in ABB's advanced process control model builder.

Model builder functionality

- Neural networks
- Analytics
- Model predictive control
- Open/close loop simulation
- Controller diagnostics
- Fuzzy logic
- Soft sensors
- First principle model construction

Other ABB technologies, such as the secure remote access platform (RAP) and KPI monitoring enhances the collaboration between user and ABB, making it easier to maintain applications during process and optimization strategy alterations.

Customer-oriented delivery

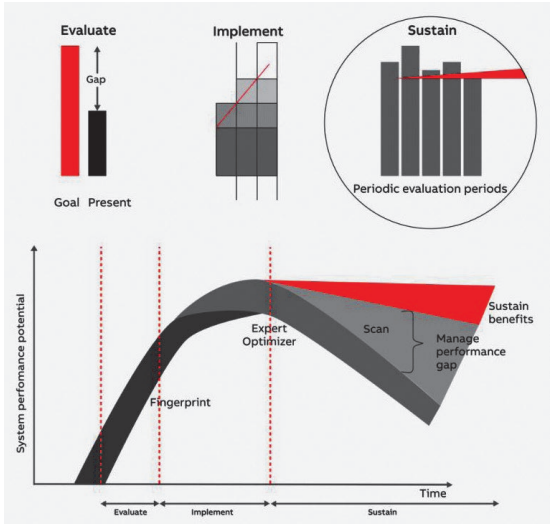
Every plant's advanced process control system needs to be tailored to that facility's specific production needs. EO brings the flexibility to adapt to each plant. As such, an end-user only pays for what they really need.

- **Software only:** EO software licenses can be purchased by those that prefer to build their own application
- **Turnkey solution:** Get EO with your selected applications from the ABB portfolio including engineering and commissioning and benefit from ABB's proven applications for the cement industry.

In either case, users can purchase a single license or sign up for software license subscription which automatically benefits from the latest functionalities and software improvements at a fixed annual fee.

A road map for successful installation

- **Cement performance Fingerprint:** ABB collects various information on-site to ensure smooth engineering and implementation. Potential applications are identified based on current performance, base level health and plant economics. A baseline and road map for digital applications is then defined. This forms the business case for implementation where applications with the fastest return on investment are scheduled first.
- **Implementation:** ABB engineers model the process using plant knowledge, historical and step test data to construct the multivariable controller. The controller is then tuned to exploit the plants' constraints to maximize profit and minimize cost. Commissioning is performed on-site together with operators and process engineers to ensure a successful change management.

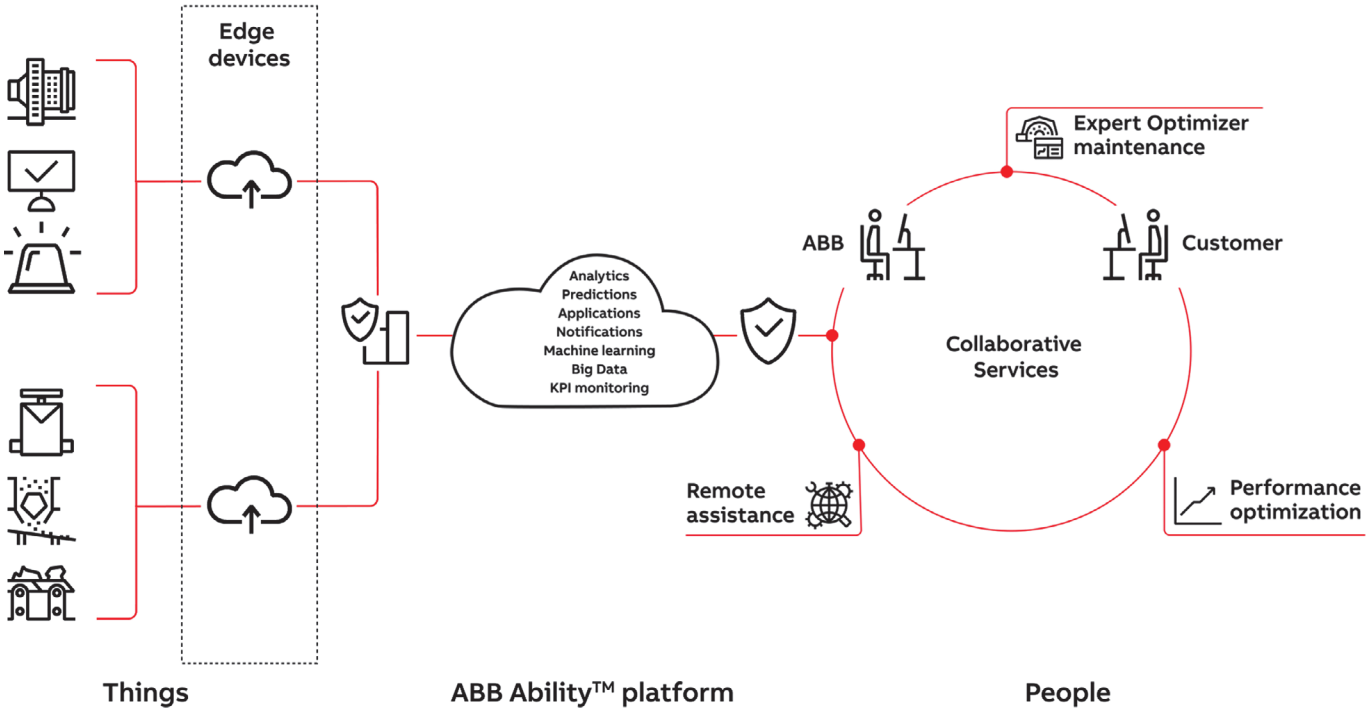


Performance optimization for cement

Collaborative service offering

Having served the cement industry for over 20 years and with EO employed in over 200 cement plants worldwide, ABB has a proven track record in sustaining the benefits over the lifecycle of the plant.
In today's complex cement production environment, it is impossible for anyone to be an expert on all products and processes. Therefore, ABB offers several support packages to provide maximum long-term performance of your EO installation.

- **System support:** Assistance in case of hardware faults to minimize shutdown frequency.
- **Strategy support:** Maintenance of EO applications to meet optimal performance. Includes an onsite visit and remote support.
- **Full product support:** Includes all above packages. Subscribers benefit from reduced labor day rates.
- **Subscription services (SaaS):** With subscription services, the initial capital expenditure is minimized, and benefits sustained via ongoing controller maintenance. This ensures a rapid return on investment for the end user with sustained benefits.



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