

Cement plant performance optimization
Benchmarking, correction and sustaining
services to improve system performance

Process and energy consulting optimization services identify and remove performance problems to improve operational performance and energy efficiency at cement plants - using diagnostic, corrective and long-term continuous improvement activities.

Cement FingerPrint

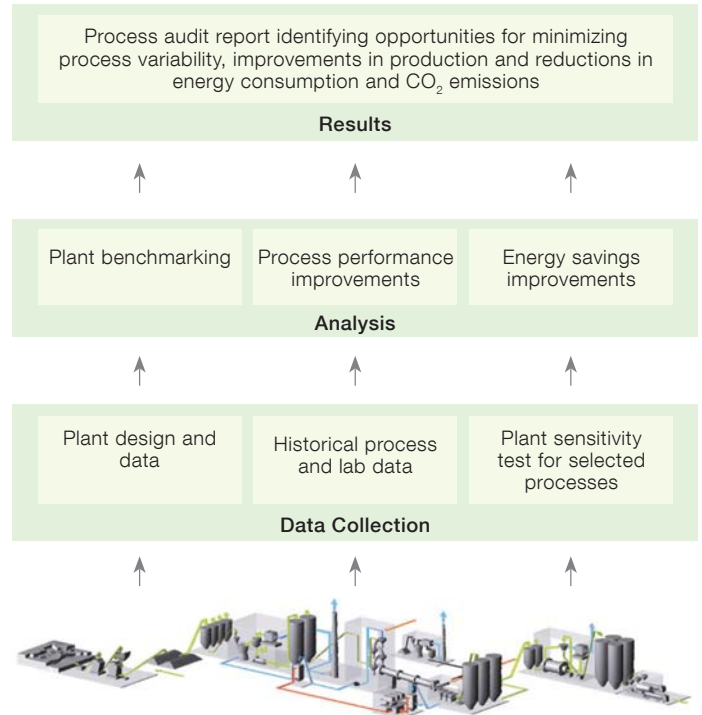
ABB's Cement FingerPrint is a process optimization and energy consulting service designed to capture, analyze and improve operational performance and energy efficiency of the cement making process. Using ABB's analytical and process modeling tools, complimented with in-depth industry specific knowledge and competency, we help the customer to achieve operational excellence.

Cement FingerPrint facilitates customers to collaborate with ABB experts to achieve optimal process performance and improve cost effectiveness. Cement FingerPrint ensures tuning of plant control system efficiently, benchmarked to Industry-best practices. Further, Cement FingerPrint offers a systematic approach in capturing the process sensitivity using plant step tests, building a dynamic process model, analyzing site constraints and identifying improvement opportunities. On review and acceptance of the solutions, the same can be implemented to realize identified benefits.

Deliverables

Cement FingerPrint identifies potential benefits and offers improvement opportunities including:

- Plant benchmarking with industry standards
- Plant variability study
- Control loop performance report
- Process performance analysis
- Energy efficiency potential
- Access to best practices



Phases

- Collection of operational data
- Analysis of process performance and site constraints
- Plant modeling
- Usage of obtained process models and operational data to identify process enhancement and energy efficiency opportunities

Benchmarking, correction and sustaining services to improve system performance

Workflow

The complete implementation process is carried out in three phases:

1) Pre-study phase

- Historical key data collection
- Agreement on schedule

2) FingerPrint implementation phase

- Plant tests, model building, operational data analysis, improvement opportunity identification and benefit analysis

3) Benefit realization phase (if approved)

- Recommendation implementation

The workflow comprises of the following steps:

- Collection of plant data
- Execution of plant step tests and modeling
- Calculation of potential benefits
- Report generation
- Report and workflow validation
- Submission and discussion with customer

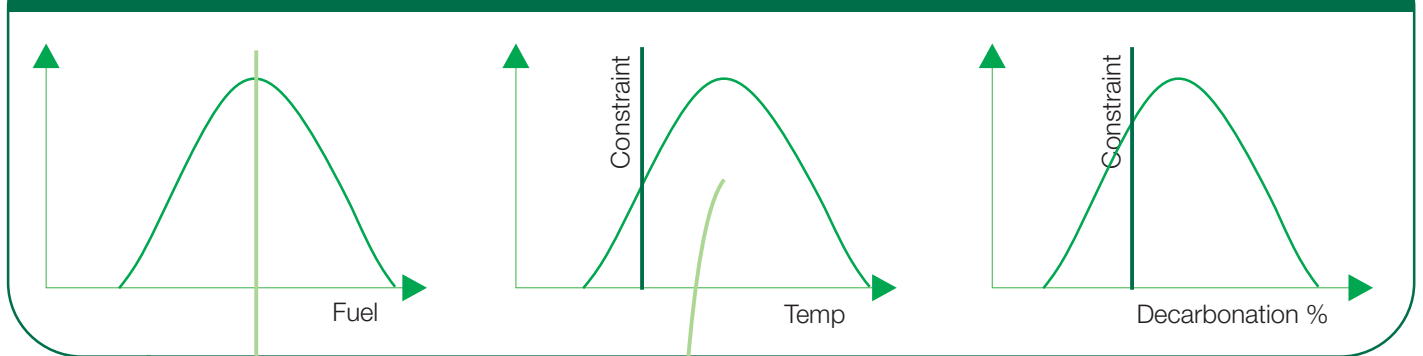
Value proposition

- Process and energy consulting service for cement plants
- Higher production and better quality
- Lower energy consumption and reduced CO₂ emission

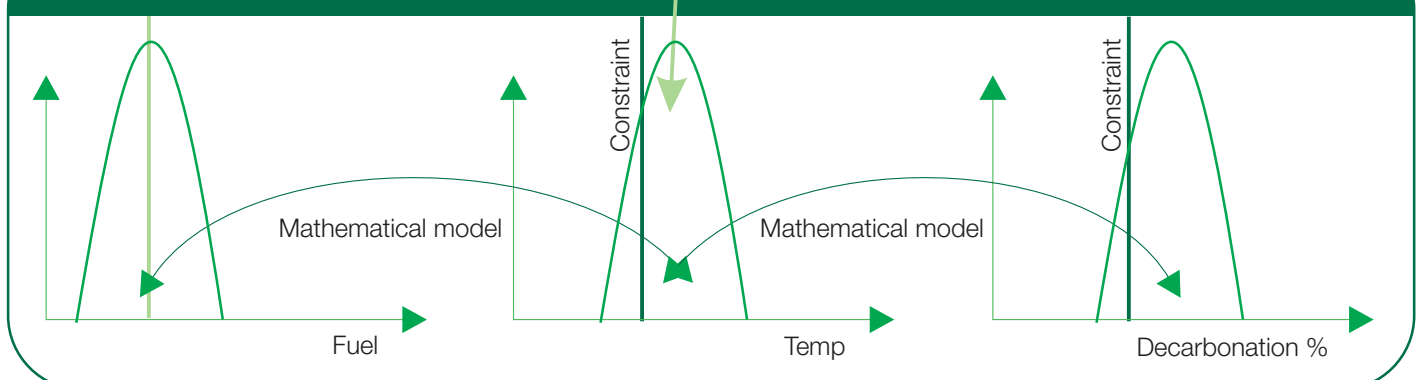
Cement FingerPrint is directly related to ABB's solution portfolio for cement industry

- Process control system
- Variable speed drives
- Instrumentation and Actuators
- Continuous gas analyzers
- Emission monitoring
- Online measurement for bulk materials
- Advanced process control solutions
- Heat recovery power plants
- Energy management solutions

1. Precalciner operation as per collected historical data



2. Optimized precalciner operation after execution of Cement FingerPrint projects



ABB's CementScan and CementTrack services are extensions of Cement FingerPrint specifically designed to help customers sustain high performance.

Cement FingerPrint provides a plant area benchmark, together with a set of recommendations aimed to increase the plant performance and its energy efficiency. Once the customer has implemented these recommendations, we have to make sure that these investments continue delivering the expected performance. ABB's CementScan and CementTrack services have been designed to help the customer sustain the high performance reached. These long term sustainability services are thus extensions of Cement FingerPrint by which the benefits reached are made permanent via close monitoring of the area Key Performance Indicators (KPI) defined during the FingerPrint project and timely designed actions.

- CementScan: Customer subscribes to the FingerPrint service to take place at least twice per year in an area, where the finger print has already been made.
- CementTrack: KPIs are tracked on continuous basis from ABB's Minerals Remote Monitoring Center (MiRMC). Reports are provided on monthly basis. As a rule, CementTrack will require installation of specialized software at the customer site in order to gather the data on a continuous basis.

Sustain performance with CementScan and CementTrack

ABB's optimization services ensure that performance is not only maintained, but also improved through continuous monitoring and corrective actions. Plant engineers work with ABB experts on a continuous basis, achieving optimal machine availability and improved performance. Plant engineers work with ABB experts on a continuous basis, achieving process and system availability and improved performance.

CementScan provides periodic diagnostic monitoring of Cement plant's performance levels to maintain smooth system operation. Monitoring frequency and service modules are customizable so plants can match them to their own site requirements. Key Performance Indicators (KPIs) are accessed from a smart database (DataPRO), including configurable events such as: triggers, time stamps, execution periods, or operator request. CementScan's stored information is accessible on-demand to calculate KPIs for viewing and automated reporting.

CementTrack provides continuous monitoring between CementScan periodic reporting deliveries. It allows predefined KPIs that can be used as notification triggers to ensure problems are not overlooked. Based on thresholds, persistence, windowed analysis or user-specified conditions, triggers can be tied to notification options for specific conditions. Notification options include: alarms, phone calls, emails, triggered data storage or text messages. To maintain performance at top levels, CementScan and CementTrack special purpose process monitors, engineering and maintenance tools, quickly identify ongoing sources of disturbance.

Remote enabled technology through MiRMC

ABB standardized secure high-speed remote connectivity meets or exceeds established connection policies. CementScan and CementTrack services can take advantage of remote connectivity for reliable access to site data.

Remote service with CementScan and CementTrack includes three extremely useful elements: remote connectivity, monitoring and diagnostics along with the availability of ABB's technical experts 24/7.

With an installed base of more than 100 billion USD of automation products and systems worldwide, ABB is continually working on ways to improve the ways these products are supported. Our remote service is a direct response to our clients' changing needs.

Remote service provides real-time access to high-level technical resources. This lowers a plant's costs by reducing or eliminating emergency field service deployment, cement system downtime and less-than-optimal system performance. The end result ensures that the best knowledge available is accessible to the right people in your operation, at the right time, to support your plant's installed assets and ensure process performance improvements.

Minerals Remote Monitoring Center (MiRMC)

MiRMC is a high-end integral service offering from ABB for the minerals industry to provide remote monitoring, periodic patch and release updates, and modification of the plant operating systems. MiRMC integrates process consultancy service with remote diagnostic services for processes and systems. MiRMC facilitates customers to collaborate with ABB experts for them to achieve improved quality and improved cost effectiveness. A step-wise process is followed which allows key data, both historical and current plant operation ones, to be monitored by ABB experts by not being in the site in person and in return predict potential problems, and resolve errors.

Value proposition

ABB experts will have access to plant operating system's Distributed Control Systems (DCS) through a secured network. This would ensure secure access to client's network without security concerns. The communication server provides a secure connection between Virtual Support Engineers (VSEs) and the Service Center. VSE exchanges the data with the MiRMC through the secure SSL-encrypted tunnel, which is established after authentication of the server-side SSL certificate and client-side finger print.

- Competent and certified resources
- Secured environment
- SSL encrypted connection to plant system
- Actricity tool based case tracking
- Unique service ID generation
- Well-defined automated workflow
- Plant access through approved work permit
- Audit trail for complete traceability
- Knowledge management for re-use

Benefits

A well-executed remote service offering reduces unnecessary maintenance, improves production efficiency, tracks causes of failures, provides fault diagnosis and recommends actions. It also provides notifications of impending failures allowing proactive corrective actions.

The benefits include

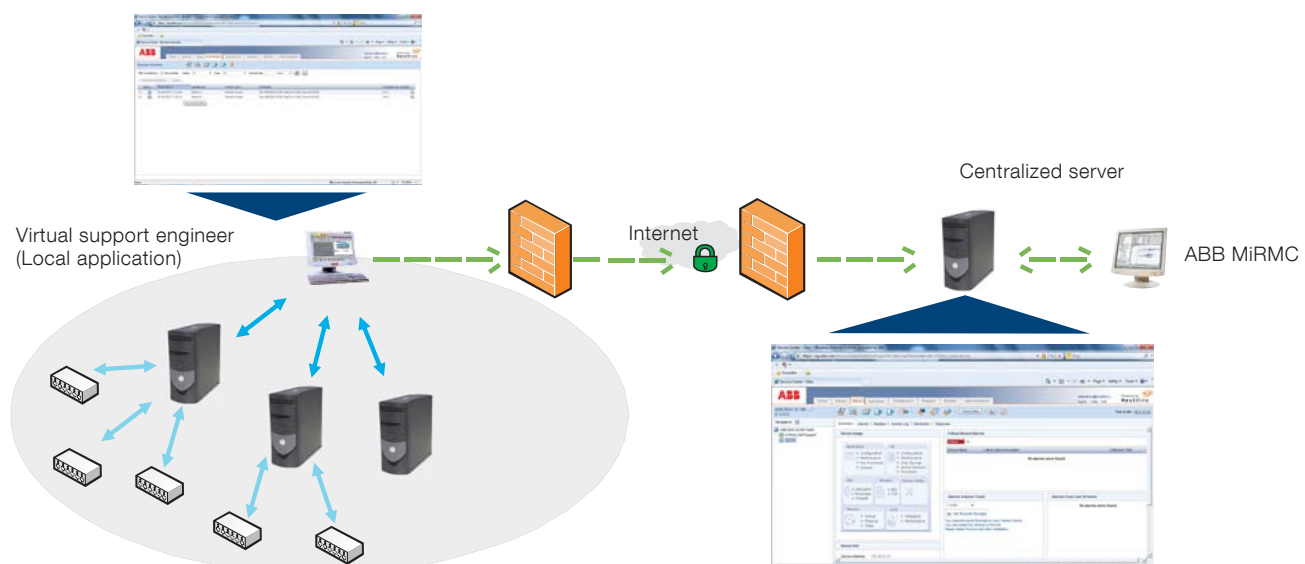
- Lower operating cost
- Enhanced plant availability
- Maximized production
- Improved quality
- Increased life expectancy

Basic offerings

Our fundamental offerings cover all administrative, technology and consultancy aspects governed by defined processes, firm strategy and effective decision-making process.

They include,

- System upgrades and maintenance
- Periodic patch and release updates
- System status monitoring
- System modification and enhancements
- Loop performance monitoring and tuning
- Process consultancy (CementScan)
- Access to global knowledge repository
- 24x7 service support
- Training



Cement process analysis, diagnostics and optimization

ABB has extensive cement process know-how acquired through decades of collaboration with leading customers of this industry. In particular, process optimization has been one area where ABB has excelled with hundreds of kilns, mills and blending systems delivered in the last few years.

This knowledge is now encapsulated in the Cement Finger-Print process in order to provide a framework in which analysis of benefits can be made in a generic and reliable manner.

Blending area

In this area ABB will analyze data such as feeder accuracy, material variability, measurement procedures and chemistry statistics in order to propose improvement possibilities.

Benefits

- More consistent feed chemistry
- Constant material flow
- Optimal tradeoff between material costs and chemistry deviations
- Optimal handling of (frequent!) feeder trips
- Better handling of feeder constraints and time delays

Pyro area

In this area ABB will analyze data such as fuel mix, feed feeder accuracy, sensors available, flame quality, emission, cooler performance. Proposals might include new instrumentation, loop tuning services, advanced process control systems.

Benefits

- Increased output
- Reduced fuel consumption
- Reduced emission levels
- Reduced electricity consumption
- Reduced quality variability
- Reduced refractory consumption

Grinding area

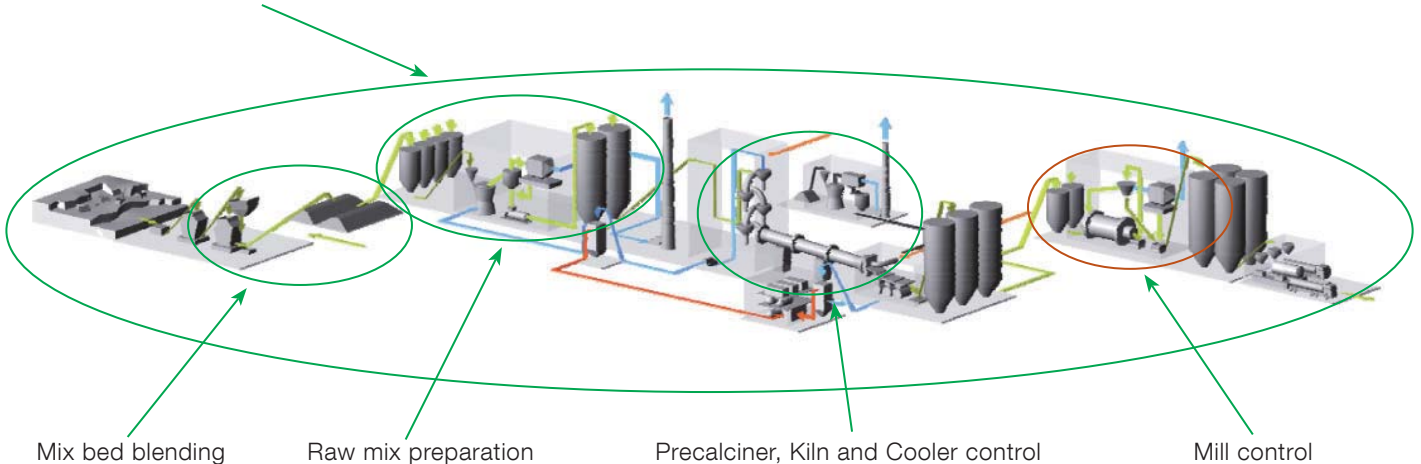
In this area ABB will analyze data such as reject rates, vibration data, temperature, water injection system, heat generators, fans. Proposals might include loop tuning services, better operating set points and advanced process control systems.

Benefits

- Production increase
- Reduction in specific energy consumption
- More consistent product quality
- Reduction in the consumption of grinding media

Starting point: Advanced process control portfolio in cement

Holistic energy management



Energy management solutions

Reducing energy consumption, associated costs and environmental impact

Energy efficiency and energy cost reduction are the top priorities for the cement and minerals industry. ABB has extensive experience in developing and supplying energy management solutions that meet their needs.

ABB's energy management solutions reduce energy use and costs, and also improve the company's overall carbon footprint.

Who can benefit from ABB's energy management solution?

Opportunities for cost reduction are the greatest when

- Electricity consumption and prices vary over time
- Captive power facilities are owned by the customer
- Large power consumers can be disconnected or connected in relatively short periods of times
- Multiple sites need a coordinated approach

Energy management solutions achieve an overall cost reductions of 2 to 5 percent of the total electrical energy bill.

How does the energy management solution work?

Customer sites are modeled as an economic flow network with a number of balancing areas interconnected by connection points that model the transfer and conversion of energy and material. The total consumption, or outbound flows, of the utility in the balancing area is balanced with other supply resources, or inbound flows. Depending on the objectives of a specific case, the resources are selected to minimize the total energy cost or to maximize the total profit of the operation over a specified time range.

The model is populated with customer design and real-time data such as prices, volumes, flows, production rates and other relevant information to give an updated mirror image of the plant energy flows at all times.

Steps for a comprehensive energy management solution

Step 1. Monitoring: based on real-time data, a comprehensive system for monitoring of the energy consumption is built by ABB. To assess current status and trace the success of different measures is the goal.

Some examples of the performance reports are:

- Consumption and cost per hour/day/ month/year, by individual and aggregated users
- Consumption and cost per end product unit
- Analysis of load profile and peak demand
- Benchmarking (comparing current performance against the past)
- Best practices and performance due to them
- Budget tracking

Step 2. Forecasting: energy consumption is forecasted over intervals of a few minutes and hours to several days using production plans and real time data from the plant. To see in a timely manner if energy consumption is violating current contracts with suppliers, going beyond known grid capacity or outside given boundaries by management would be is the goal. Real-time corrective measures are at last possible.

The module predicts the total utility consumption within by integrating and extrapolating the flow in the tie-line. Alarms can be generated enabling the operator to take action to limit the deviation, if the predicted volume exceeds pre-set or calculated alarm limits,

Step 3. Optimal planning: at this point ABB solutions calculate optimal production schedules that meet production needs, satisfy the plant and grid constraints at the lowest possible cost.

For example, it is possible to configure the system for automatic connection of plant captive power or stoppage of non mission critical equipment. The goal is to provide the best possible energy consumption pattern at all points in time.

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ABB's Minerals business unit, with headquarters in Houston,

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Lithuania, Malaysia, Mexico, Norway, Oman, Peru, Poland,

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