# Case Study

## Reference

- Germany - Holcim's Lägerdorf plant.

## Product

- Expert Optimizer 5.0 (employing Model Predictive Control Precalciner Temperature control).

## Summary

The Lägerdorf plant wanted to increase alternative fuels utilization, get closer to the optimal calcination conditions and reduce the risk of process disruption. In August 2006 ABB successfully installed their Expert Optimizer (EO) version 5.0 solution, encompassing their new Model based Precalciner Temperature (PCT) control solution, on the calciner at Lägerdorf. The technologies used are Model Predictive Control (MPC) and Mixed Logical Dynamical Systems (MLD). The benefits achieved by the installation are that process condition deviations have been reduced by 50%. Furthermore, it has been possible to bring the precalciner average temperature towards optimal values and reduce the risk of cyclone blockages.

## Project Description

Holcim's Lägerdorf plant uses a large number of alternative fuel materials that have a high variability of calorific value and are difficult to transport and dose. Further, material samples are often not representative and temperature measurements alone do not allow identification of which component generated a change in the fuel mix properties. These were the motivations for Holcim to seek a solution to help them improve the conditions at the plant.

## Solution

ABB installed their new Model based Precalciner Temperature (PCT) control solution as part of their EO solution. PCT was installed on the calciner at the Lägerdorf plant in August 2006. The technologies used are Model Predictive Control (MPC) and Mixed Logical Dynamical Systems (MLD).

ABB's PCT has successfully overcome the plant's problems by applying a MPC+MLD scheme that includes unique combination of adaptive first principle mathematical models. The controller detects the gap between what is measured and what is expected, to derive appropriate corrective actions. In order to mitigate disturbances in the process conditions the system takes into account factors like material transport delays, the system's thermal inertia, flame conditions, combustion air supply, etc. Additionally, accurate modeling of the calcination reaction as a function of the precalciner temperature plays a central role in the scheme. Peculiarities associated with the transport system have also been considered.

## Benefits

Thanks to the unique features of the MPC+MLD technique, PCT is able to anticipate the effects of events and take optimal corrective actions both in advance and afterwards. The resulting benefit is that process condition deviations have been reduced without any modifications to the plant hardware. Thanks to the PCT solution, occasional temperature excursions have been reduced substantially. Further, it has been possible to bring the precalciner average temperature towards optimal values and to reduce the variability of this important parameter by more than 50%. As a result of implementing ABB's PCT solution the Lägerdorf plant has reduced the risk of cyclone blockages and thus of costly disruptions in production.