

Profit Suite for Lime Kiln

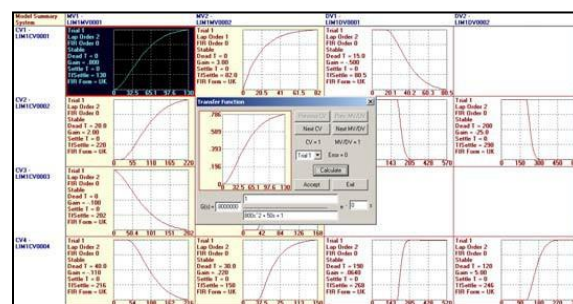
Solution Note

Profit Suite™ for the Lime Kiln increases production capacity reduces lime quality variations and deadload, and boosts production in the whole mill

The objective of the lime kiln process is to produce uniform quality of lime with low energy consumption. It is achieved by controlling the temperature profile of the kiln and residual carbonate of lime, which is measured by laboratory analysis. The fuel(s) of the kiln and ID fan speed are adjusted based on the temperature profile, excess oxygen in flue gas and residual carbonate. The production rate is controlled based on the lime mud tank level. The control takes into account secondary energy flow (if it is not controllable) and moisture of the lime mud as a feed forward. Model predictive control technology is used to improve the lime kiln process and quality management.

Profit Suite for the Lime Kiln supervises the existing regulatory loops and is DCS-independent, although integrating this Honeywell's Experion® Process Knowledge System can control and optimize the entire pulp mill.

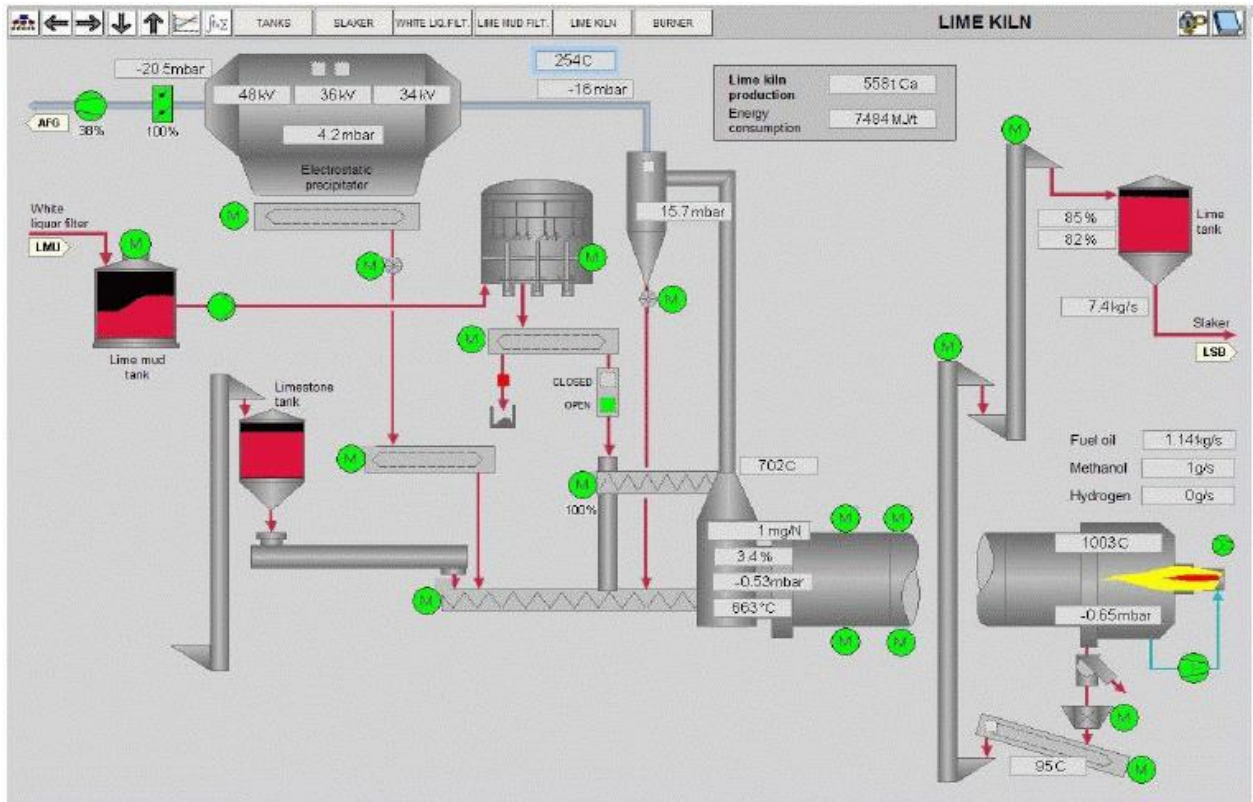
Honeywell's lime kiln solution powered by Profit Suite is a comprehensive collection of advanced process control and optimization applications. These innovative solutions address increasing business complexity and profitability pressures by effectively managing all aspects of control and optimization, from improving regulatory loop control to optimizing the entire process.



Profit Suite Development Environment

BENEFITS

- Increase energy efficiency by 5-7%. Use less energy per ton of lime production by controlling the temperature profile of the kiln and avoiding temperature excursions.
- Increase the reliability of your kiln
By controlling absolute temperature as well as temperature variation, Honeywell's lime kiln solution avoids ring building in the kiln which reduces the number of unplanned outages. Additionally, this control typically reduces thermal stresses on the refractory and increases its effective service life.
- Increase lime conversion by 3-5 %. By optimizing the temperature control, the average residual carbonate is optimized, residual carbonate variation is decreased and the lime availability is increased. This translates into higher quality white liquor and downstream causticizing efficiency.
- Increase environmental compliance
Regulate drying and maximize combustion efficiency for both equipment and environmental protection.
- Increase lime production by 4-6%. With Profit Suite controlling the entire lime kiln operation, multiple variables are coordinated for maximum production, while maintaining energy efficiency, lime quality and minimizing maintenance concerns.
- Improve operator productivity
Task oriented operator displays provide clear view to the process and allow easy access for changes.



Lime Kiln Overview Display

In the lime kiln process, Profit Suite improves lime quality (residual carbonate), reduces energy usage and maximizes lime kiln efficiency, while integrating the entire lime kiln process to drive mill-wide optimization.

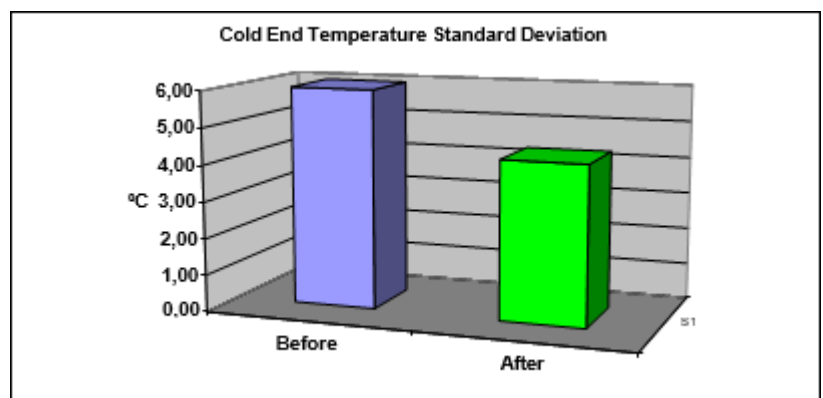
Profit Suite for the Lime Kiln optimizes the following areas:

- Fuel flow control (primary, secondary, etc.)
- ID fan speed or damper position control
- Temperature profile control
- Residual carbonate control
- Excess oxygen control

Production Rate

Profit Suite for the Lime Kiln controls the production rate. It changes automatically lime mud flow to kiln based on level(s) of lime mud tank(s) inventory.

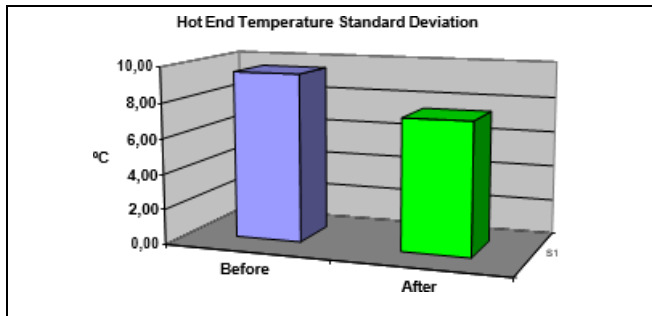
Temperature Profile Control



Profit Suite Development Environment

Profit Suite for the Lime Kiln provides optimal temperature profile for all process zones: Drying, heating and calcining. Feed end and hot end temperatures are basis for temperature profile control.

Midsection (if available) temperature can be also used in temperature profile control. It also compensates for changes in the temperature profile which have occurred when there are changes in production rate, secondary energy flow, and lime mud moisture issues.



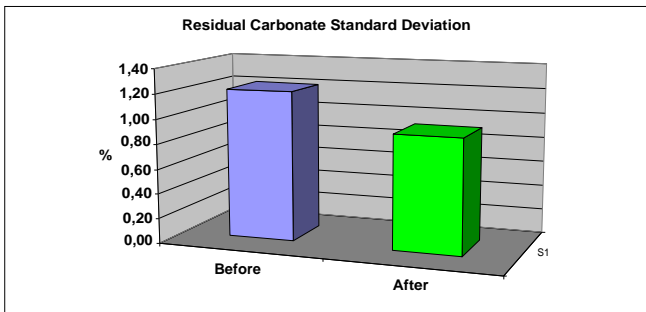
Hot end temperature standard deviation is reduced by 22%

Excess Oxygen and TRS Control

Excess oxygen and TRS in the flue gas is kept at the lowest level possible, while achieving the best possible lime burning rate.

Residual Carbonate Control

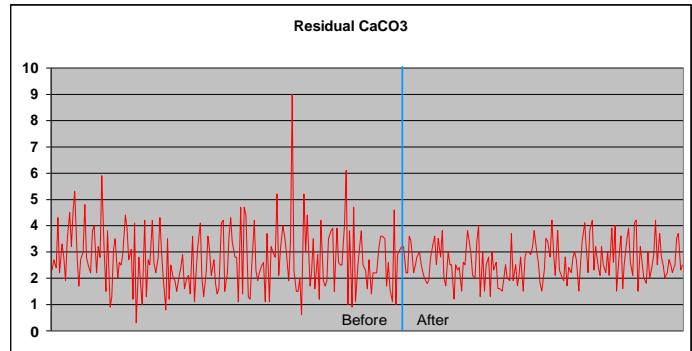
Residual carbonate is kept at the optimal level, while the best possible lime reactivity is achieved.



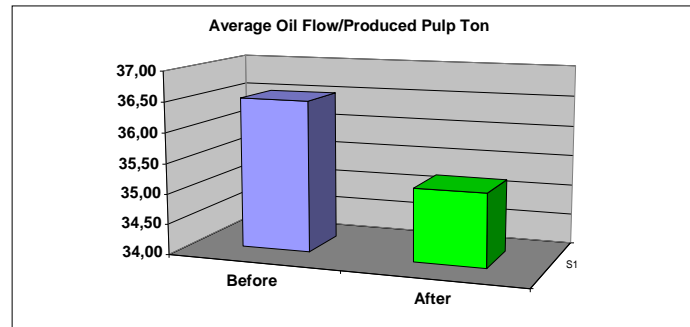
Residual carbonate standard deviation reduces by 24%

Significant Improvements in the Lime Kiln Process Management

The main purpose of Profit Suite for the Lime Kiln is to improve lime quality. The model predictive controller performs this function by decreasing the variation in lime quality. This is documented by actual mill results, which are shown in the graph below:



Average oil flow per produced pulp ton is 3.5% less with Lime Kiln control



Residual CaCO₃ variability is reduced with Profit Suite for the Lime Kiln

Statistical Process Control: Lab Update

Any inferential model has error due to either random variance or systematic causes. Random variance sources include lab variability, process variability at sample time, uncertainty of sample time, etc. Updating models with lab values whose variance is random can lead to increased variability in product qualities. Such updating should not be performed. Systematic causes of model error, such as model assumptions, unmeasured process disturbances, or changes in lab technicians, can cause a shift in the bias between the process and model. Lab values indicating such a shift should be used to update models.

Improve Mill Performance

In summary, the optimal lime kiln efficiencies are achieved with exact control, which takes all process conditions into account. The optimization will minimize the process variation resulting in increased production capacity, reduced costs and better energy efficiency.

Profit Suite Support Services

Profit Suite comes with premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers improve and extend the usage of their applications and the benefits they deliver, ultimately maintaining and safeguarding their advanced applications.

For More Information

Learn more about Honeywell's Profit Suite at our website www.honeywell.com/ps, or contact your Honeywell account manager.

Honeywell Process Solutions

1250 West Sam Houston Parkway South
Houston, TX 77042

Honeywell House, Arlington Business Park
Bracknell, Berkshire, England RG12 1EB UK

Shanghai City Centre, 100 Zunyi Road
Shanghai, China 200051

www.honeywellprocess.com

SO-19-04-ENG
April 2019
© 2019 Honeywell International Inc.

Profit Suite™ is a trademark of Honeywell International Inc.

The Honeywell logo, consisting of the word "Honeywell" in a bold, red, sans-serif font.