



# Improve Product Quality and Efficiency

## Background

In these times of rising energy costs and competitive pressure to produce a higher quality product, the lime kiln has become a source of opportunity to reduce operating costs and improve efficiency. The process is highly interactive with long dead times and lends itself very nicely to a model predictive control optimization strategy. SmartProcess<sup>®</sup> Lime is a proven lime kiln optimization solution consisting of state-of-the-art technology, process expertise and project execution excellence.

## Operational challenges

The retention time in a lime kiln is typically 2 - 4 hours. This long dead time between the feed-end and discharge end, along with the complex dynamics between energy input, air flow and feed rate make it very difficult for an operator to manage the temperature profile, excess oxygen and emissions. For this reason, manually operated kilns typically operate in a less than optimal state, with high variability in key measurements.

## Performance objectives

- Reduce energy usage per ton of lime produced
- In multi-fuel applications, maximize the least expensive fuel
- Maximize mud throughput and reduce purchased lime requirements
- Reduce lime quality variability with optimized temperature profile control
- Minimize operator interaction with the system and reduce variability across shifts

## SmartProcess<sup>®</sup> Lime features

SmartProcess Lime uses model predictive control (MPC) as its core technology along with many additional features that enhance the solution:

- Cascaded MPC to logically separate feed-end and firing-end dynamics
- Simple production rate control
- Lime quality control
- Multi-fuel optimization
- Lime rock handling
- Primary air control
- Mud filter controls



Emerson experts utilize a powerful multi-variable model predictive controller that is also designed for ease-of-use. The process identification tools are seamlessly integrated into your operating environment. Setting up testing takes a matter of minutes and a model is created and a controller built at the touch of a button. The tuning parameters are highly intuitive and easily accessible from a standard set of displays.

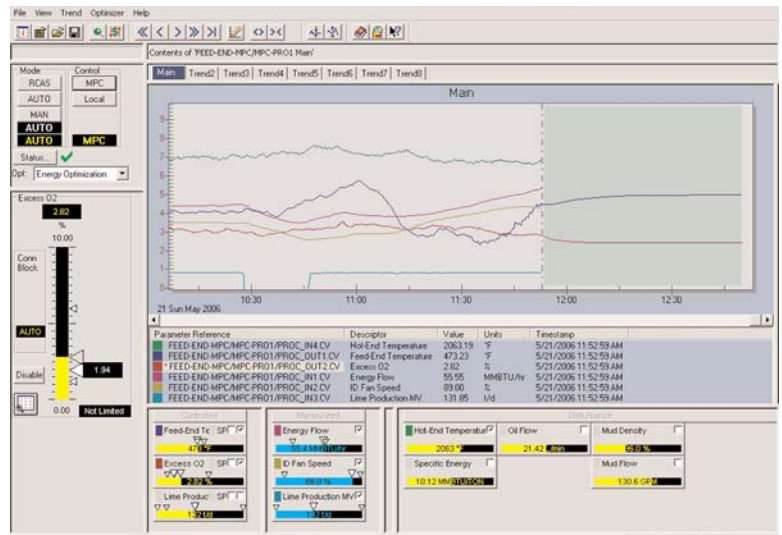
For online visibility the MPC operational display is second to none. The operator can see future predictions at a glance and organize his own custom view with a few mouse clicks.

Custom displays are also provided to integrate with the DCS operation. The solution is available for any system with OPC or serial communications capability. Emerson can provide services to configure most major automation platforms.

## The Emerson solutions approach

Emerson's project approach includes auditing current lime kiln performance to identify any instrumentation deficiencies and estimate savings potential. A critical deliverable of the project is operator training. A qualified application engineer will use a simulator to walk your operators through the use of the application to best prepare them to get the most out of your new system.

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## How SmartProcess works with PlantWeb

SmartProcess solutions can work within Emerson's PlantWeb® digital architecture to offer further visibility and performance reliability. This can help ensure the success of the project far into the future. Critical areas where Emerson products will add significant value include:

- The DeltaV™ digital automation system's engineering environment makes model predictive control easily accessible for critical loops
- Micro Motion® mass flow and Fisher® valves with smart positioners help with mud flow and density control as well as fuel flow
- Rosemount ProBar® Flowmeter with smart transmitters help with primary air flow
- Rosemount Analytical Oxymitter™ with smart transmitters help with flue gas oxygen measurements
- Systems can be monitored for health and calibration using AMS™ Suite asset optimization software

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