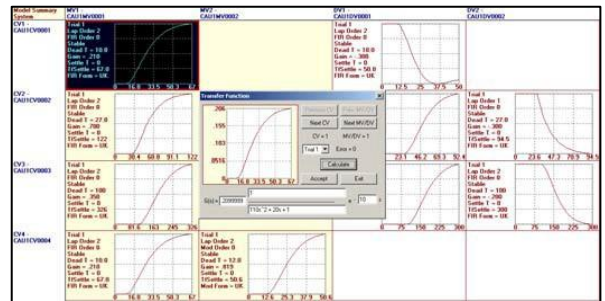


Profit Suite for Causticizing

Solution Note

Honeywell’s Profit Suite™ for Causticizing increases causticizing efficiency, reduces white liquor variations and dead load, and boosts production in the whole mill

The objective of the causticizing process is to produce uniform quality white liquor with a high causticizing efficiency. Honeywell’s Profit Suite for Causticizing has been developed to control the process to accomplish and maintain this objective. It is achieved by controlling the causticizing efficiency, which is measured with an on-line analyzer or conductivity measurement supported with a laboratory analysis. The green liquor and lime feed ratio is set and adjusted based on the temperature difference, the causticizing efficiency and the slaker temperature. The control takes into account the green liquor density or TTA and green liquor temperature as a feed forward. The green liquor temperature is also used to control slaker temperature. Model predictive control technology is used to improve the slaking process and quality management.



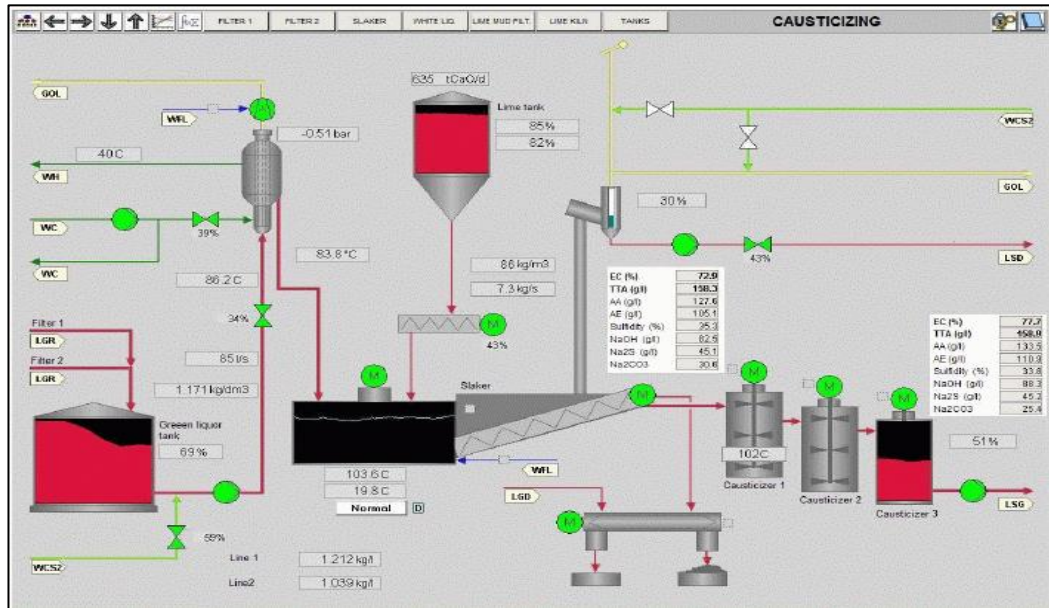
Profit Suite Development Environment

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 causticizing solution powered by Profit Suite is a comprehensive collection of advanced process control and optimization offerings. 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. In the causticizing process, Profit Suite improves white liquor quality, reduces energy usage and maximizes causticizing efficiency, while integrating the entire causticizing process to drive mill-wide optimization.

BENEFITS

- Reduced causticizing efficiency variation by 20-40%
- Causticizing efficiency target shift by 1-2%
- Increased production capacity by 2-5% through reduction in deadload
- Reduced lime consumption
- Reduced energy consumption in the lime kiln
- Improved operator productivity
- Reduced operating costs

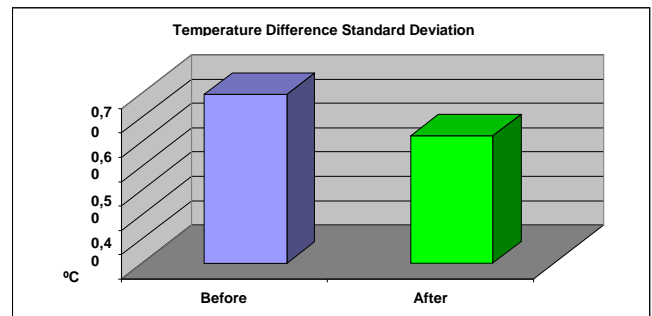


Causticizing Overview Display

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Control Functions

- Causticizing control includes:
 - Green liquor/lime feed ratio
 - Temperature difference across the slaker
 - Causticizing efficiency control
- Slaker temperature control
- Liquors inventory control



Temperature difference standard deviation is reduced by 25%

Causticizing Control

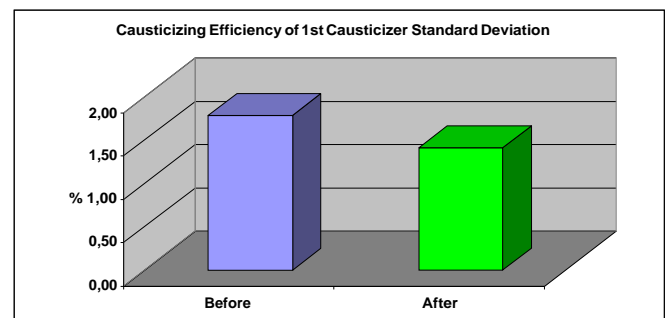
The most important parameter affecting the final equilibrium causticizing efficiency is white liquor strength as measured by total titratable alkali (TTA). This maximum possible causticizing efficiency is commonly known as the Goodwin Equation. One of the most important functions of Causticizing Control is to operate the plant as close as possible to the equilibrium causticizing efficiency (CE%) without exceeding the mill maximum.

Temperature Difference Control

Slaking reaction temperature is calculated from the green liquor temperature and the slaker temperature. Changes in lime quality are indicated by changes in the temperature difference and are compensated by adjusting the lime/green liquor ratio.

Causticizing Efficiency Control

Causticizing efficiency (CE%) is measured on-line and analyzed in the laboratory. The on-line analyzer normally takes samples from white, green and freshly causticized white liquor (lime milk). The Causticizing Control uses causticizing efficiency after the slaker (lime milk) and after the last causticizer tank. The causticizing efficiencies are controlled by the lime/green liquor ratio.



Causticizing efficiency of 1st causticized standard deviation is reduced by 21%

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Lime/Green Liquor Ratio

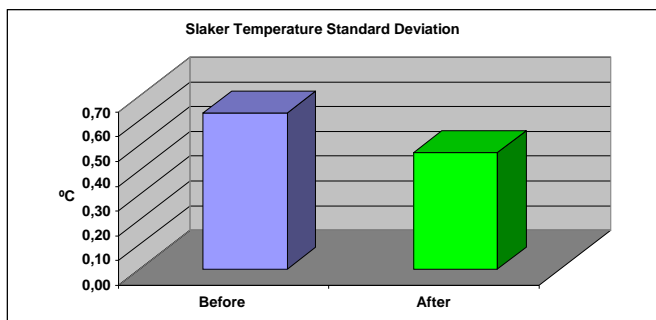
The lime/green liquor ratio control adjusts the total lime feed based on the green liquor flow. The stoichiometric ratio control adapts the lime feed quality, green liquor concentration and to an appropriate level during production changes and thus creates the basis for fine adjustments.

Green liquor TTA/density and Temperature

Changes in green liquor TTA/density and temperature are causing variation to the product (white liquor). The Causticizing Control will minimize that variation.

Slaker Temperature Control

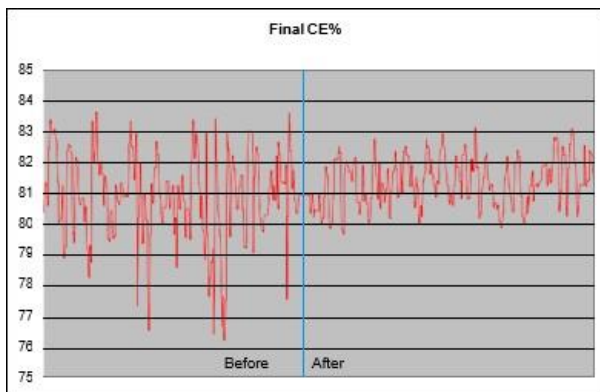
The aim of slaker temperature control is to keep slaker temperature at optimal level and prevent overheating of the slaker. Slaker temperature is controlled by the lime/green liquor ratio and green liquor temperature.



Slaker temperature standard deviation is reduced by 25% with Honeywell solution

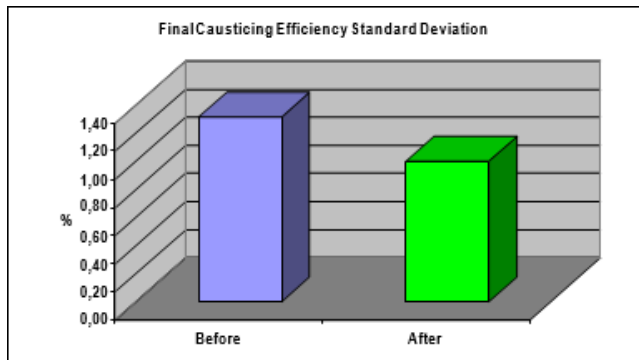
Significant Improvements in the Causticizing Process Management

The main purpose of Profit Suite for Causticizing is to improve causticizing efficiency. The model predictive controller performs this function by decreasing the variation in causticizing efficiency. As a result, a causticizing efficiency target shift of up to 1-2% is possible.



Final CE% variability is reduced by Profit Suite for Causticizing Package

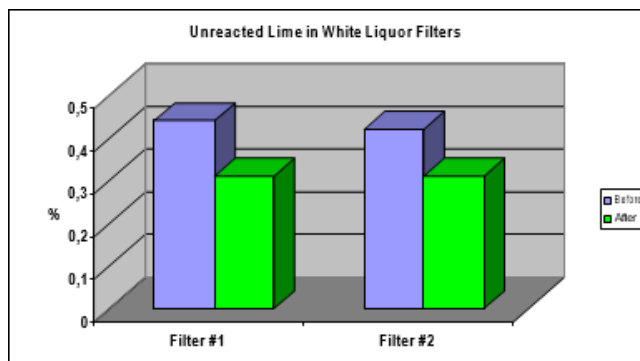
Profit Suite for Causticizing is a key element of Honeywell's Pulping Solutions. These solutions are designed to improve quality and operational flexibility, reduce operating costs, and minimize environmental impact.



Profit Suite for Causticizing reduces final causticizing efficiency standard deviation by 24%

Liquors Inventory Control

The liquors inventory control changes the green flow according to a new desired rate setpoint. During the ramping of rate, all critical control loops in the causticizing plant are monitored. When applicable, the green liquor flow rate control changes can be coordinated with the upstream and downstream process units inventory. The target value for the green liquor flow rate is than dependent on the overall desired inventories capacity. Control of the liquors storage (green & white) inventories balance will improve the operation of the causticizing plant by continuously monitoring and modulating the green liquor flow rate to and from each process units using the inventory storage to smooth green liquor flow rate changes and mitigate product qualities variation.



Profit Suite for Causticizing reduces unreacted lime in white liquor #1 filter 29% and #2 filter 27%

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 causticizing efficiencies are achieved with exact control, which takes all process conditions into account. The optimization will minimize the process deadload 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 how Honeywell's Profit Suite can improve your plant operation by visiting our website www.honeywellprocess.com or contact your Honeywell account manager.

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